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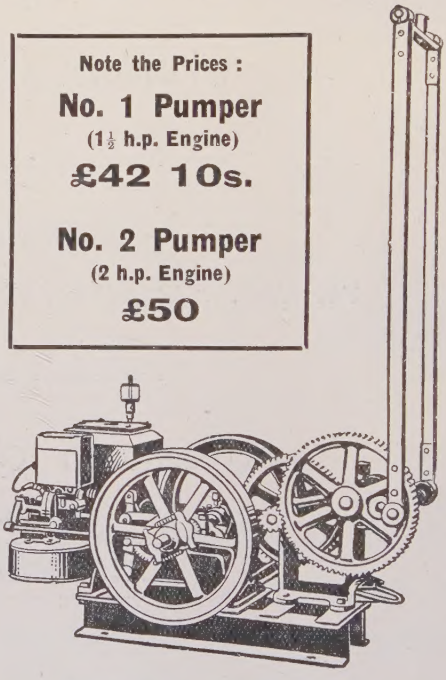

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CONTENTS.

SILAGE, ENSILAGE, AND SILOS	Geo. L. Sutton	467
LEAF CURL OF PEACH AND NECTARINE	W. M. Carne	472
BROOM MILLET	G. K. Baron-Hay	473
CAPE WEED	W. M. Carne	480
APPLE SCALD	Geo. W. Wickens	482
A NEW POISON PLANT	C. A. Gardner	484
ALPHENUS MALI	L. J. Newman	486
POTATO CHIPS	G. R. Lowe	488
EXPORT OF EGGS	W. T. Richardson	495
THE ESTABLISHMENT OF USEFUL FODDER PLANTS AND ELIMINATION OF WORTHLESS SCRUB	A. B. Adams	496
COTTON	The Editor	501
NOTES ON THE PASTORAL INDUSTRY	H. McCallum	507
EARCOCKLE AND A BACTERIAL DISEASE	W. M. Carne	508
FRUIT FLY	L. J. Newman	513
HORTICULTURAL NOTES	Geo. W. Wickens	516
SPOTTED THISTLE	W. M. Carne and C. A. Gardner	519
POULTRY HOUSING	W. T. Richardson	521
CODLIN MOTH	L. J. Newman	531
DAIRY CATTLE IMPROVEMENT	P. G. Hampshire	535
FULGHUM OATS	I. Thomas	541
BEERSEEM OR EGYPTIAN CLOVER	W. M. Carne and C. A. Gardner	542
CLEARING LIGHT LANDS AND SCRUB ROLLING	A. I. Horan	544
PHYSICAL CONDITION OF SOIL	B. L. Southern	547
IRRIGATION, PART II.	A. R. C. Clifton	550
THE DALIACK SHEEP TROUGH	Geo L. Sutton	567
FARMERS' FIELD TRIALS	H. Rudall	569
BLACK MEDIC OR ENGLISH TREFOIL	W. M. Carne and C. A. Gardner	570
BREAD MAKING	Margaret A. Wylie	572
RETURN OF WHEAT PRICES, C.I.F. AND E. LONDON, SEPTEMBER, OCTOBER, NOVEMBER		576
LIVE STOCK AND MEAT RETURN		577
MARKET REPORT		577
METEOROLOGICAL INFORMATION		579

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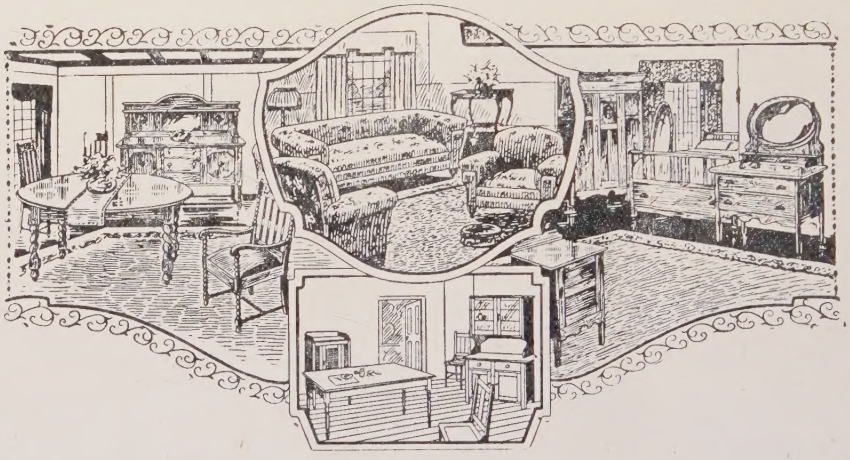

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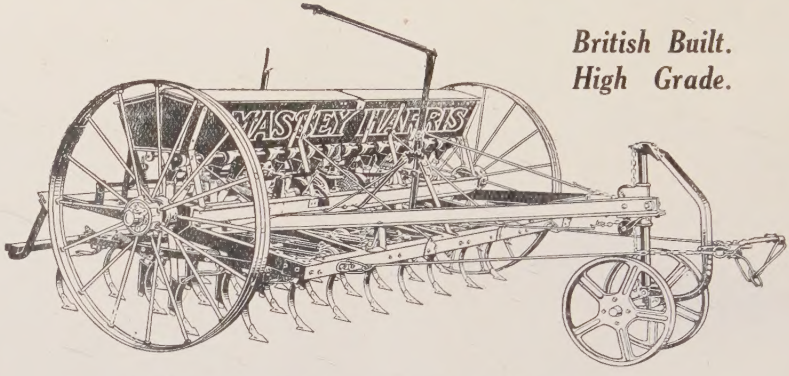

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JOURNAL

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WESTERN AUSTRALIA.

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SILAGE, ENSILAGE, AND SILOS.

GEO. L. SUTTON,
Director of Agriculture.

The words "Silage" and "Ensilage" are sometimes regarded as having the same meaning, and therefore as being interchangeable. This is not so.

Silage is green forage—natural or cultivated—which has been conserved in a succulent form.

Ensilage is the process by which such forage is preserved—almost in its natural state—by the exclusion of air.

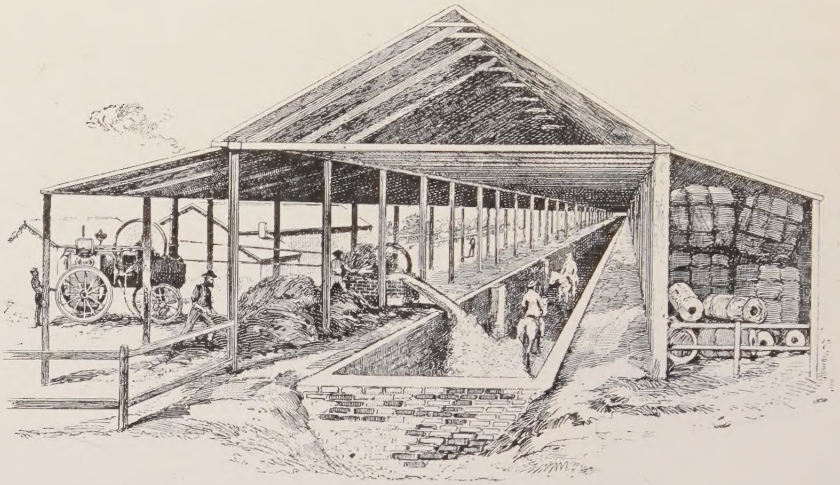
A silo, which originally meant a pit or hole in the ground for keeping grain, now implies any sort of receptacle above or below ground for storing or preserving agricultural produce.

The making of silage is probably of great antiquity. There is no doubt that grain was preserved in pits by the ancient Persians and Romans, and Professor McBryde reasoning from historic data collected by him has drawn the inference that green crops were also preserved. Certainly in the early part of last century the pitting of green crops, including sugar beet tops, was practised by the farmers of several European countries.

It is recorded that silage making was introduced into America in 1875 by Mr. Manly Miles, of Michigan, and that the first silo was built in 1876 by a Mr. Morris, of Maryland, as the result of reading the reports of trials conducted in France by M. Auguste Goffart, who had thoroughly described his methods in a publication issued at an earlier date, and entitled "Manuel de la Culture et de' l' Ensilage des Mais et d'autres Fourrages vert" (The Cultivation of Maize, and the Preservation of it and other Green Forage Crops as Silage).

The practice was introduced into England in 1882, largely as the result of a visit of the Vicomte de Chezelles, who had constructed in France a silo capable of holding 1,000 tons of silage, and who, whilst at the Royal Agricultural Society's Show at Reading, gave details as to his methods.

Silage was also introduced into Australia shortly afterwards, for in "Practical Dairying for Australia" (1893), Dowling records "the first agriculturalist to introduce silage in a business-like form in Australia was Mr. Walter Lamb, of Rooty Hill and Liverpool Plains, New South Wales." The actual date is not given, but the context implies that it was about 1883.



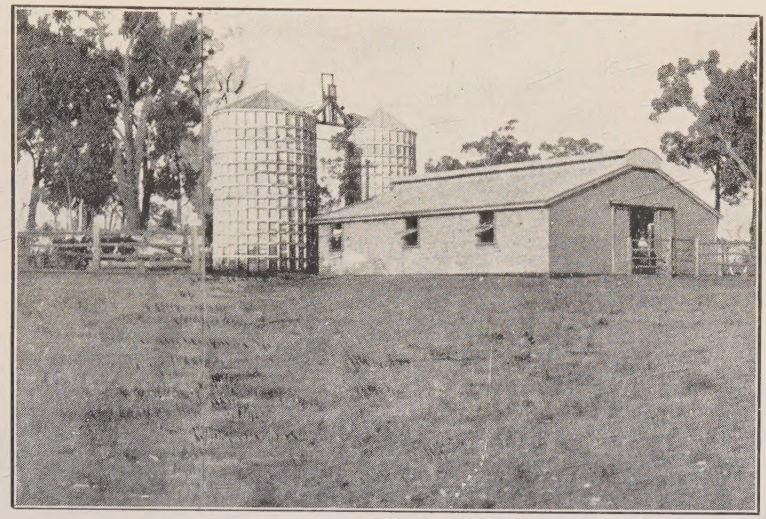
Underground Silo constructed at Rooty Hill, N.S.W., by Mr. Walter Lamb, and said to be the site of the first silage made in Australia.

In the "W.A. Agricultural Journal" for July, 1901, it is stated that "Mr. A. W. Bolden wrote from Peak Hill on June 13, 'According to a promise made some twelve months ago, I am writing to tell you that the silage made by me in a pit turned out very well indeed.'" This is the earliest reference found regarding silage made in Western Australia, and presumably to Mr. Bolden must be given the honour of being the pioneer in this connection for having made silage some time in 1900.

The first "above ground" silo in Western Australia was probably erected at the Narrogin School of Agriculture in 1904, though about the same time a round brick silo was also built at Burekup by the late Mr. Venn. The one at Narrogin was built of stone, it was 12 feet in diameter, and 20 feet high. In 1907 two larger silos of the modern American type, and constructed of wood and lined with galvanised iron were erected at the Narrogin School of Agriculture, and a few months later two similar silos were erected at the Brunswick State Farm. About this time several silos were also erected by farmers, but following this date no special interest was taken in silage in this State until about six years ago, when a great stimulus was given to silo construction and silage making, consequent upon the increased attention being given to dairying and the essential association of silage with that industry. To assist this forward movement a bulletin entitled "Ensilage and Silo Construction" was issued in 1920 by Mr. P. G. Hampshire, Superintendent of Dairying.

A boom in silage making followed its introduction into both Great Britain and America, but with quite different subsequent results. In America it has been followed by the general and permanent adoption of the practice

as a feature of farm economy, and in consequence most American farms are now equipped with one or more silos the total number of which exceeds six hundred thousand. In Great Britain the great expectations at its introduction have not been realised, and the practice of silage making is anything but general. The position in 1909 was described by Professor M. J. R. Dunstan, who then wrote, "In 1882, when ensilage was being boomed, large sums were expended on special buildings and plant, and at the present



Above-ground wood and galvanised iron silos at the Narrogin School of Agriculture, erected 1907, and probably the first of the modern silos erected in Western Australia.

day most of these are either used for other purposes or discarded, and where the practice is adopted the cheaper and equally serviceable American silos are used."

The explanation of this entirely different attitude towards this method of conserving fodder is not far to seek, and is due to the different conditions —climatic and otherwise—which influence the farm practice of the respective countries. In both countries the conservation of fodder in both the dry and the succulent form is essential for winter feeding, and again in both, the dry food is conserved in the form of clover and grass hay. In Great Britain root crops are of such cultural importance, can be so cheaply grown and easily stored, and are so reasonably certain, that they form a ready means for supplying the succulent stock foods necessary, and in consequence it is mainly where roots are an expensive or uncertain crop that silage takes their place in Great Britain.

On the other hand in America, though roots can be grown over a large portion of the agricultural area, maize is the principal crop, and can be grown more cheaply than roots. Though the maize plant can be conserved in a dry state as "maize hay" or "fodder maize," the process, because of the thickness of the maize stalks, is a somewhat lengthy one, and because of this there is a considerable risk of the loss of an undue proportion of its

food constituents during the curing process. On the other hand the green maize plant, because of its solid succulent stalks, can be readily conserved as silage, and with suitable machinery more cheaply than as "maize hay" or "fodder maize," also with less risk of loss of its food constituents. Ensilage is thus the obvious process by which the principal American crop—maize—should be conserved. It is less difficult and more cheaply conserved in this way, and as silage it provides the essential succulence for winter feeding. These facts easily account for the popularity of the silo and the extensive manner in which it has been permanently adopted as part of the American farm equipment.

Over the greater part of the agricultural area of Australia roots are relatively costly to grow, and in consequence the required succulence in conserved fodders will be obtained more cheaply in silage—though not necessarily maize silage—as in America, than in roots as in Great Britain.

When silage was first introduced into Great Britain, America and Australia many exaggerated statements were made regarding it. It was quite commonly believed that silage was better than the fodder from which it was made, and further, that weeds and other rubbish if made into silage would turn out first-class fodder; in fact at one time weeds, like thistles, were regarded by the majority of Australian agriculturalists as being the most suitable, and the proper material from which to make silage. These extravagant claims were fallacies, for though it is true that in the case of plants, like thistles, the spines became softer after being in the stack or silo, and the material in consequence is more palatable, the true position is that the food value of the silage is similar to, but rather less than the food value of the green plants from which it is made.

Silage may stay is the silo for two or more years without deterioration. Several cases of silage being held for at least 10 years are on record, and the writer recollects seeing a statement to the effect that silage had been kept in France for 119 years, but cannot at present trace the reference. Because the modern dairy cow is required to produce three or four times the quantity of milk sufficient for its calf, succulent foods are essential in its ration. Silage, because of its succulence, and because it more nearly approximates good pasture than any other form of conserved food, is therefore preeminently adapted for dairy cows, and in consequence it is more in favour with dairymen than with any other class of farmer. It promotes and maintains the milk flow, but is not a complete food in itself; it should be fed with hay or grain, and when this is done 30 to 35 lbs. per day is regarded as a satisfactory ration.

Though silage has a strong characteristic smell, good silage may be fed during milking. Some silage with a very strong odour is preferably fed after milking. As milk is peculiarly susceptible to the absorption of odours, care must be taken in feeding it to milking animals, to avoid every chance of this strong odor being absorbed by the fresh milk, and milkers, if they have been working with silage, should take care that their hands and clothes are thoroughly freed from the smell before they commence milking.

Sheep do well on silage, but American experiments indicate that it has no special value over dry foods for fattening sheep. In Western Australia it is probable that its succulence, and therefore laxative character, gives it a special value over hay for lambing ewes in the agricultural areas. With silage forming part of the ration, lambing can take place at any time, and

as early as desired, without waiting for the usual autumn rains, and consequent growth of early pasture. For sheep 4 lbs. of good silage is considered equal to 1 lb. of good hay. The amount fed to sheep should not exceed 5 or 6 lbs. per day, and from 1 to 2 lbs., with some grain or hay, is considered more satisfactory than the maximum amount of silage.

Silage can be fed to horses with advantage, provided it is fresh and the amount does not exceed 20 lbs. per day. It should be fed in small amounts at first, and preferably with chaffed hay. The addition of silage to the rations for horses will probably lessen the occurrence of colic amongst them.

Pigs will eat silage; American experiments, however, indicate that silage is not a profitable food for pigs, and though a small quantity tends to keep them in a thrifty condition, it could not take the place of even a part of the grain ration.

(*To be continued.*)

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LEAF CURL OF PEACH AND NECTARINE.

(*Taphrina deformans.*)

W. M. Carne, F.L.S.,
Economic Botanist and Pathologist.

Leaf Curl occurs wherever peaches and nectarines can be grown successfully, and is a common spring and early summer disease in this State. It also attacks almonds and apricots in some countries, but has not been recorded on these fruits in Western Australia.

Curl is always to be expected in the spring, when preventive measures have not been taken. As is to be expected, the disease is less troublesome in dry springs than in moist ones, for it is a rule that fungi require moisture for rapid development.

Varieties differ in their susceptibility, Elberta, Lady Palmerston and China Flat being among the more susceptible varieties of peach. Seedlings are usually very liable to infection.

Leaf Curl directly affects the leaves, and to a lesser extent the shoots, blossoms, and fruits. Peach blossom and fruits are not affected in this State, though the disease occurs occasionally on Nectarine fruits. Evidence of the disease may show soon after the first leaves unfold. The leaves become enlarged, thickened, and distorted over their affected parts. The whole of a leaf may be affected, but usually only portions of variable size show the swelling and blistering which gives to the disease both its popular and technical names. The curled portions are at first green, then yellow, or yellow with a pink tinge, and may become a dep red. A whitish bloom covers the surface. Finally the affected leaves turn brown, die, and fall. In this State no further infection occurs, new leaves are produced, and by Christmas the trees appear quite normal.

Infection of shoots is less common. They are stunted, curved, and more or less distorted, and the terminal bud usually dies. Dieback of the tips of young shoots not visibly affected occurs in severe infection, and is probably associated with the dropping of the leaves. Flower infection has not been noted here. It causes the blossoms to die and fall. Fruit infection is with us confined to nectarines. Rough, red, irregular areas are developed giving the appearance of early ripening.

The economic effects of Curl are as follow:—Owing to the dropping of the leaves, the amount of which of course depends upon the severity of the attack, the trees are weakened. This results, to a greater or lesser extent, in non-setting, dropping of young fruit, small fruits of poor quality, dieback of twigs, and a reduction in the production of the fruit buds and healthy growth which are necessary for the next year's crop. On nursery stock, severe infection may result in death or in weak stunted trees not suitable for planting out.

The spores (seed bodies) are developed on the affected leaves. They are formed in closely packed structures (asci), each of which contain eight spores. The asci are formed under the leaf surface, and as they develop

Peach Shoots with Leaf Curl.

cause a blistering of the surface which ruptures exposing the asci which form the bloom seen on the affected leaves. It appears, though there is lack of definite evidence, that the spores from the asci are carried over to the following spring caught in the bud scales and crevices of the bark. Be this as it may, it is fairly definite that infection takes place soon after the leaves appear. The fungus growth produced from the spores penetrates them, leading at first to abnormal stimulation of growth and later to death. Under our conditions no further infection appears to take place, so that the primary spring infection is the only one, and the spores produced on the leaves serve to spread the disease in the following, but not in the present season.

Fortunately Leaf Curl is easily controlled. In fact it responds to treatment more readily than any other important disease of fruit trees. One spraying with lime-sulphur or other fungicide during the dormant period is effective. Where a general purpose spraying with commercial lime-sulphur (1-10) is used, no other treatment is necessary. This precautionary spraying against fungi and insects is advisable on all deciduous fruit trees where action against specific troubles is not necessary. When San Jose Scale is present in the orchard, spraying with lime-sulphur (1-7) when the buds begin to swell is necessary. This will also control Leaf Curl. If Bordeaux (6.4.40) or Burgundy (6.9.40) mixtures are used, they may be applied any time during the dormant stage of the trees.

Note.—Since this article was written, and during the present month, Leaf Curl has been found on peach fruits in several localities.

BROOM MILLET.

POSSIBILITIES IN THE SOUTH-WEST.

(Conclusion.)

G. K. Baron-Hay, B.Sc.Agric.,
Senior Agricultural Adviser.

Attention prior to Harvesting—Bending the Heads.

Whether this operation is required extensively or not depends to a large measure on —(a) the seasonal conditions prevailing; (b) the character of the soil; and (c) the quality or strain of millet seed sown.

The head of the millet plant bearing the seeds and fibre is, until quite a considerable size, enclosed in a terminal sheath or leaf. Should the season have been favourable to particularly rapid growth, any temporary variation in climate, such as a few days hot weather, may cause the sheath to contract, thus not allowing the head to free itself readily. This causes a twisting of the stalk at the base of the head. This character also seems inherent

An instance where breaking down would have been profitable.

Broom Millet with head bent down.

in some strains of seed, and therefore seed from such heads should not be retained for seeding purposes. By walking through the crop such heads may be readily detected, and the head released almost without stopping, by loosening the sheath with the forefinger and thumb.

It will be noticed in almost all crops of Broom Millet that certain plants are unable to carry the mass of seed produced on the long fibres. This causes the fibre to bend and hang downwards. Fibre delivered in this condition loses much of its value, and as heads affected in this manner usually contain good fibre, any heads noticed liable to spread out owing to the weight of the seed, should immediately be bent down. This operation should not be neglected, as if the brush is allowed to mature in the natural way the head will spread out and reduce its market value, and the wet weather, perhaps, render the fibre useless.

Bending down is almost universal in America, but some Australian growers neglect this operation, and invariably have large percentages of their crops spoilt.

The operation of bending should be carried out when the seed is in the milky state and beginning to fill out, and if properly performed, will not prevent the seed maturing. The stalk is given a sharp pinch about 12in. to 18in. below the brush and bent over, so that the head hangs straight downwards. Care should be taken not to bend the stalk at a joint, as it will probably then break off.

Seed for future Planting.

The practice of reserving a quantity of seed from the bulk obtained by scraping the seed from all heads harvested is not a good one. This practice leads to poor yields, inferior brush, and therefore unprofitable returns. Just before harvesting it is recommended that the grower inspect his crop, and cut enough heads from the best plants to supply sufficient seed for next season's planting. As a guide in this direction approximately one-third (by weight) of a complete head consists of fibre. The points to be looked for are long, fine, straight fibre; a heavy yielding brush; seed heads compact; seed light brown and well filled out; freedom from disease. These heads should then be thoroughly dried, and stored in a bin (mouse-proof) with a liberal sprinkling of naphthalene powder to guard against insect pests.

Harvesting.

The time for harvesting depends upon the prevailing weather, and the demand of the market for colour. It is generally admitted that Millet having a green tinge is tougher, and more sought after by manufacturers. This, however, necessitates harvesting the crop before the seed is mature, and thus losing the feeding value in the seed for poultry.

Where a large area is to be harvested almost invariably each quality will be obtained, as the heads last harvested will be mature. At this stage the fibre is a straw or flesh colour, and is a little inferior in quality. In normal seasons it will be found that this quality sells as readily as the prime, and the value of the seed as poultry feed more than makes up any loss.

Where only a small area is grown it is recommended to harvest the crop just before the seed is mature, thus obtaining a prime article.

The actual harvesting should be carried out in warm dry weather, as if stacked while damp, the fibre becomes discoloured in a very short time.

This State is admirably suited from the climatic view point for the growing of this crop, as our conditions for harvesting are almost invariably good.

Class of Fibre to Harvest.

In the making of millet brooms it is essential that fibre of different lengths be supplied.

As practically all the broom millet fibre required for local consumption has at present to be obtained from the Eastern States, the recommendations

Types of Broom Millet Heads:—
A. Prime "hurl."
B. Prime "covers."
C. Stained and twisted.
D. Spoilt by bending down.
E. "Inferior" or waste heads.

of a conference held recently in Melbourne of growers and manufacturers respecting the specification of broom fibre to be marketed, are of value to prospective growers in this State. At this conference the following resolutions were agreed to:—

(1) *Specification of a Unit Parcel.*—Broom fibre shall be marketed on the basis of what is known as a "self-working parcel."

A "self-working parcel" shall consist of 40 per cent. "long hurl," 25 per cent. "covers" and 35 per cent. "insides" (these proportions not necessarily contained in each bale). "Long hurl" millet to consist of good, clean, sound fibre, not less than 24 inches in length, stalks not to exceed 4 inches. "Covers" to consist of good, clean, sound fibre, not less than 18 inches in length, stalks not to exceed 4 inches. "Insides" to consist of good, clean, sound fibre, not less than 6 inches in length, with stalks 8 to 10 inches long.

All millet must be well threshed and securely baled.

All "inferior" millet to be baled separately. "Inferior" millet covers coarse, curly, weather-stained and damaged millet.

(2) *Standard Bale.*—After one year's grace the whole of the millet to be harvested in uniform bales, specifications of which are to be agreed upon.

From the above it will be seen that fibre less than 6 inches in length does not warrant harvesting.

The operation of harvesting is performed by cutting the heads, with the correct length of stalk, using a butcher's or some other suitable knife. The sheath enclosing the base of the brush should be removed at the same time, as this facilitates drying, and deprives aphidae of shelter, which insects are almost invariably found in crops of millet.

"Tabling" the Crop.

The Broom Millet plant is a very sturdy grower, and on good soils a crop not infrequently attains a height of 12 to 14 feet, which makes harvesting a strenuous proposition. The method of "tabling" will enable harvesting to be done with the least amount of trouble.

"Tabling" is the practice of bending a high crop down to bring the brush within reasonable distance of the knife. The farmer bends two rows at a time, walking backwards, placing the plants diagonally across each other, so that the brush is on the two sides of the table, and forming a latticed platform about 3 feet above the ground. If the crop is "tabled" the heads may be placed on the table in small bundles, the brush all lying the same way, until dry. This usually takes about two days. If the crop is a large one it is advisable to have a drying shed arranged with shelves of wire netting, similar to those used for drying currants.

Hackling.

"Hackling" is the process of removing seed. A home-made contrivance for this work may be easily constructed. Such a machine consists of a tough wooden drum about 18 inches long and 15 to 18 inches in diameter, bound at each end to prevent splitting. Stout nails, with the heads removed, are driven at regular but "staggered" intervals, leaving a small space between each. This is mounted with a steel axle, and revolves in a wooden or other bearing, placed in a stout frame, high enough for easy turning. It requires to be driven at a high speed, and this may be attained by attaching the handle to a large cogwheel, which engages with a much smaller one fixed to the axle of the drum, or may be driven by some power plant.

Growers of small areas will find that a steel comb, suitably mounted, or even a cleft stick, which is held with one hand to give the requisite pressure, will answer the purpose.

Bale of Broom Millet Fibre, as imported into this State.
Note heads all towards the inside.

Yield per Acre.

In the Eastern States the yield ranges from 8 to 16 cwts. of good fibre per acre. At present prime hurl is worth rather more than £60 per ton, and has not been below £50 for some time.

Besides the fibre the seed has a certain commercial value, and sells readily as a poultry food at prices ranging from 1s. 6d. to 2s. 6d. per bushel.

The portions of the plant not utilised may be chaffed and used as a roughage for feeding cattle, but is preferably burnt to destroy any pests that may have been in the crop, and has some value as a fertiliser, the ash being specially rich in potash.

From this it will be seen that Broom Millet offers reasonably good prospects as a profitable sideline to dairy farmers in this State.

CAPE WEED.

(*Cryptostemma calendulaceum*, R. Br.)

Cape Weed, as its name implies, is a native of Cape Colony, where it is said to be very common. It has been naturalised in Western Australia for a long time, being recorded by Preiss from Fremantle in 1839, and from King George's Sound by the Austrian traveller Huegel in 1833. It will thus be seen that its occurrence here is almost, if not quite as old as the Colony, and thus it came to be regarded by Bentham and others as a native plant.

The name *Cryptostemma* is derived from two Greek words *krypton*, to hide, and *stemma*, a crown, meaning that the woolly pappus (the crown of the fruit) is hidden.

Cape Weed is a member of the Daisy family, and produces seeds in great numbers. Every so-called flower will produce probably well over 50 florets and seeds. It is an annual, and thus has to rely upon its seed-producing capabilities to exist from year to year. This capability is well illustrated by the way in which Cape Weed takes hold of some paddocks, particularly in the Avon district, where in September large areas are yellow with the weed. Year by year it spreads in these districts, the roadsides and waste lands providing the places where the weed carries on when paddocks are kept clean by fallowing and cultivation, and when allowed to enter it soon assumes a dominant role.

Typically the Cape Weed grows in low dense tufts, the stock branching out at the ground level, and covering areas from one to three feet in diameter. When the plants are young they are readily eaten by stock, and more particularly so when dry and dead. For this reason it is in some districts regarded as a good pasture plant, but its gregarious methods are fatal to more nutritious herbs which might occur in the same areas. A disadvantage of the plant is that after flowering season it quickly dies, and soon disintegrates leaving the areas upon which it grew quite denuded.

Where clean farming is practised in drier areas Cape Weed is not serious, in fact it is regarded as a useful plant, and this happily is the type of country in which it thrives best. In moister soils where more valuable pasture plants occur or may be cultivated, it must be regarded as a weed, since it crowds out the grasses and smaller pasture plants, and interferes with crops.

Cape Weed is not poisonous, but the tough cottony fibre which surrounds the small seeds may cause digestive troubles.

Description of Plant.—An annual herb with prostrate branches attaining a height when closely grown of nine to 18 inches, much smaller and more spreading in open spaces, the branches thick and succulent. Leaves stalked, lyrate or runcinate-pinnatisect (see plate) woolly-white underneath, green above, the terminal segment the largest and rounded, the lateral segments oblong or lanceolate and variously toothed or lobed. Flower heads large and solitary, resembling simple daisy-like flowers, the ray-florets yellow, usually green underneath in the upper half, the disc-florets purple-brown or almost black.

For further particulars see plate.

Cape Weed (*Cryptostemma calendulaceum*).

A. Portion of flowering plant.
B. Leaf.
C. Flower head.
D. Ray flower centre of head.
E. Flower from centre of head.

APPLE SCALD.

Geo. W. Wickens,
Superintendent of Horticulture.

Readers of the "Journal" will remember that in the issue for December, 1925, particulars were published of results obtained from the use of prepared wrapping paper for the prevention of scald on "Granny Smith" apples when held for long periods in cold storage.

In the test referred to the paper used was an American production, and mention was made that as soon as fruit was available a further test would be undertaken, using a paper prepared in Australia by Messrs Spicer & Detmold. The apples chosen were again "Granny Smith," not because this is the only variety subject to scald, but it is one of the main commercial varieties grown in the State, and considerable loss occurs annually on account of its susceptibility to injury from this cause.

To make the test uniform five cases of fruit, all of one size—2¾ inches—were secured from the same orchard; placed in the Government Cold Store at Perth on 30th April, and held at an average temperature of 33 degrees.

Case No. 1 was unwrapped.

Case No. 2 was wrapped in sulphite tissue paper (ordinary apple wrapper).

Case No. 3 was wrapped in 12in. x 12in. oiled paper (7lbs. substance).

Case No. 4 was wrapped in 10in. x 10in. oiled paper (7lbs. substance).

Case No. 5 was wrapped in 10in. x 10in. oiled paper (10lbs. substance).

"Substance" refers to the quality of the paper, not the dressing, and "10lbs. substance" means that 480 sheets of that paper, each measuring 20in x 30in., weighs 10lbs. before treatment; and similarly, "7lbs. substance" weighs 7lbs. for the same number of sheets before treatment.

The fruit remained in cold storage for a period of five months, being taken out on Friday, 1st October. The apples were removed from the cases, unwrapped and placed on the stand at the departmental exhibit in the Royal Show on the following Monday morning, 4th idem., and remained on the stand until the 9th.

At the time of unwrapping the fruits, in only one case (No. 1) showed a marked difference to those in the others, the majority in this case being more or less affected by "scald," while very little was noticeable in any of the other cases.

On the 9th—nine days after removal from cold store—each apple was examined, and the following results noted:—

Case No. 1. —Every apple affected with scald; most of them very badly.

Case No. 2.—32 apples affected with scald; 26 badly and 6 slightly.

Case No. 3.—5 apples affected with scald; 2 rather badly and 3 slightly.

Case No. 4.—5 apples affected with scald; 1 badly and 4 slightly.

Case No. 5.—1 apple very slightly affected with scald.

The test made this year shows:—

Firstly: How necessary it is to use prepared paper when cold storing "Granny Smith" apples; and

Secondly: That the paper prepared in Australia by Messrs Spicer & Detmold is equally as efficient as that prepared in the United States, in addition to being much cheaper.

Australian prepared paper costs about three times as much per bushel case as the ordinary sulphite; the former averaging about 6d. per bushel case and the latter about 2d., but the extra cost is recouped many times over in the price the unscalded fruit brings in the market; and when buyers, particularly those who have window displays in the principal streets, know they can depend on "Granny Smiths" wrapped in oiled paper to retain their appearance in the window the demand for this fruit will increase greatly. At the present time any interested person may notice from about the 1st August onwards in any year "scalded" "Granny Smith" apples appearing amongst clean specimens in the windows in Perth, and this can be prevented if prepared paper is used.

It will be noted from the above that the best results were obtained with paper of 10lbs. substance, and in the comparative costs quoted this quality is referred to.

Paper of 7lbs. substance is 3d. cheaper per 1,000 sheets of 10in. x 10in. than the same quantity of 10lbs. substance, but the slightly greater cost of the better quality paper is more than compensated by the better results.

A NEW POISON PLANT.

(*Oxylobium tetragonophyllum*, E. Pritzel.)

C. A. Gardner.

In August of the present year the above plant was received from Mr. A. Green of the Ravensthorpe district as a suspected poison plant, and feeding tests were conducted by the Veterinary Pathologist (Mr. W H. Bennetts), upon two wild rabbits and a guinea-pig, all of which died, the symptoms being convulsions soon followed by death. The lethal doses ranged from 1.2 to 4.0 grams. of material (mixed flowers, buds and leaves) placed with damp chaff and bran. In his summary the Veterinary Pathologist reported:—"The flowers and buds of *Oxylobium tetragonophyllum* are very toxic. They are apparently only slightly irritant, but have a pronounced nervous stimulant effect. Their toxicity was not removed by soaking in one per cent. aqueous solution of potassium permanganate for five hours and washing. It would therefore appear that the toxic principle is fairly stable, and that the plant when in the flowering stage is likely to prove toxic for some time after grubbing. It would further seem doubtful if potassium permanganate will prove effective as an antidote in cases of poisoning with this plant."

The plant in question is only known from the vicinity of Ravensthorpe, where it is fairly common, occurring in the scrub lands. It is usually a small shrub of 18in. to 2ft. in height, and somewhat resembles the Box Poison in appearance, except that the branching habit is much more spreading and the leaves are thicker, shorter and inclined to be rectangular with conspicuously rolled edges. The accompanying plate exhibits the habit of the plant. The leaves are dark green above and the flowers are orange-yellow.

First collected by L. Diels between the West and Phillips Rivers in 1901; the plant was originally described by Pritzel in 1905.

A New Poison Plant. (*Oxylobium tetragonophyllum.*)

APHELINUS MALI.

L. J. Newman, F.E.S.,
Economic Entomologist.

This tiny introduced parasite has done remarkably good work against the Woolly Aphis. It appears to be now well established in most of our apple growing districts.

Excellent reports have been received as to the value of this introduction as a controlling factor of the Woolly Aphis.

With the view of determining how it would operate against Citrus Black Aphis (*Siphonophora sp.*) a test has been carried out. Two years ago several Citrus trees were found in a metropolitan orchard to be badly infested with the Black Aphis. Colonies of the Aphelinus mali were intro-

(*Original.*)

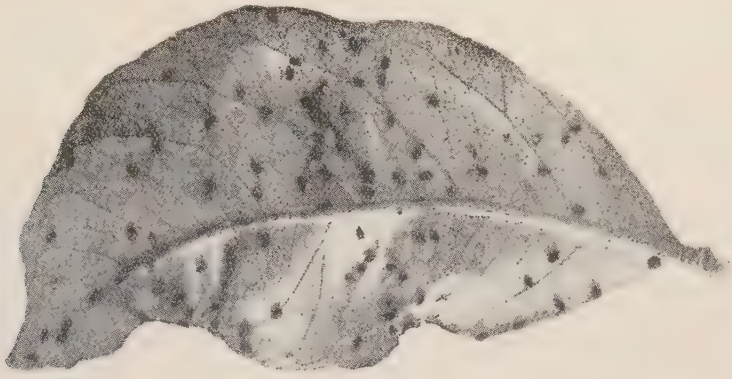
Aphelinus mali.
Adult female wasp. Magnified x 25.

duced and the trees left unsprayed. For the first year the parasite did not appear to make much headway. During the month of October just past, it was observed that the parasite was present. Two weeks later, the typical swollen parasitised bodies of the dead aphis were noted. Continuous observations were made, and it was soon revealed that this parasite had successfully coped with the outbreak.

A careful examination showed that practically every aphide had been struck by the parasite. A feature which indicates when the aphides have become parasitised, is the separation which takes place. When non-parasitised, they live in colonies or communities. When parasitised, however, they scatter all over the backs of the leaves and there fix themselves and die.

In operating and depositing her eggs, the parasite was observed in every instance to approach her victim, stroke it with her *Antennae*, and then turn around and back towards it, shooting out her long ovipositor and depositing her egg in the posterior portion of the aphides body.

The utlimate result has been the complete control of the aphis in the trees in which the test was made.



(*Original.*)

Parasitised Orange Aphis, destroyed by *Aphelinus mali.*

From these trees we have been enabled to collect and distribute many colonies of the parasite. Should this excellent result prove general against the Citrus Aphis, the importance of the introduction and establishment of this parasite will be greatly enhanced.

(*Original.*)

Typical sprig of Lemon foliage, showing the separation of the aphides when parasitised.

POTATO CHIPS.

G. N. Lowe,
Senior Potato Inspector.

CERTIFIED SEED POTATO SCHEME.

This is a scheme for the improvement of the standard of seed potatoes. It is realised that the potato industry, in common with all other primary industries, cannot give a maximum reward to those engaged in it unless something is done to overcome the existing haphazard selection or, to be more correct, non-selection of seed. At the present time anything resembling a potato almost is classed as seed when the occasion arises. As a consequence a great deal of dissatisfaction and loss is caused to growers on account of poor stuff with no high productive strain behind it being circulated.

Crop grown from certified seed.

As the Potato Branch is impressed with the extent of the losses—the loss to the grower in cash when realising on his crop, the economic loss of labour which should return a much higher reward, and the loss to the State at large—this scheme is designed to prevent as far as possible any continuance of this loss by an immediate remedy—not that this scheme will entirely eliminate losses occasioned by the use of inferior seed, even if it be adopted by every grower in the State. It is, however, thought to be the

beginning of a stage of greater productivity, leading to the point when stud seed will be available for growers, giving them the fullest opportunity of recovering a maximum return for their labour.

The first step to be taken under the scheme is for the grower to make application for inspection of that portion of his crop which promises well for seed purposes. The area must be clearly pegged out and proper attention to "rogueing" carried out by the grower during the growing period to ensure seed true to name. After, say, three close inspections during growth the inspector will be present during bagging, and if satisfied of the cleanness, trueness to type, and proper grading of the tubers to 2½in. in diameter, the bags (new) will be sewn in his presence, and then by him sealed and tagged. No certificate will be furnished unless the crop inspected, taking into consideration the season, should yield well. For instance, a 3-ton crop in a season not altogether suitable will be as valuable for seed as a much heavier crop in a suitable season. The crop must also conform to the standards set out in the certificate.

The register of the growers under this scheme will be kept by the Potato Branch, so that all inquiries for first-class seed may be referred to the officers of the Branch.

The tag or label to be attached to each bag will have set out on the front of it the grower's name and address, the variety and grade of the tuber, the signature of the inspector, and the date on which the produce was inspected. On the back of this label will be set out the conditions of the granting of the certificate. Bags must be stencilled in 3-inch type with the name and address of the grower.

The charge for the services of the inspector is 4s. per ton. Where no certification follows no charge, of course, will be made.

Applications to come under this scheme will not be made until the crop is sufficiently forward to form a reasonable idea of its promise or ultimate yield.

Probably this winter, one of the wettest on record, will long be remembered by growers, and particularly those who persist in excessively early planting, as productive of one of the lightest crops for a number of years.

The trouble commonly known as "Crinkled Leaf" amongst growers, or to give its correct name "Mosaic," has been most noticeable in all early plantings and so bad in wet ill-drained land in numerous cases as to limit large areas to a yield of 1½ to 2 tons per acre.

This disease, which was briefly referred to in the last issue of this Journal, is what is termed by our botanist friends a virus disease, and can be communicated from plant to plant by leaf-sucking insects such as aphids, or can be transmitted by affected and healthy plants rubbing together so as to cause injury to the leaves, or similarly with tubers in the bag.

For a long period this potato trouble has puzzled botanists in England and America as the disease organism could not be detected microscopically, and was so minute as to pass through the finest filter then devised.

Much research has now led to the fact being established that "Mosaic" is actually a degenerate or "old age" disease, and is reducing the potato crops of England and America to the extent of 25 per cent.

"Mosaic" it is now claimed is the reason for none of the old favourite varieties of 20 to 30 years ago surviving, as with the dwindling yields so caused it was imperative to introduce new varieties, resulting in the final complete disappearance of the old.

Normal Potato Plant.

The accompanying illustrations of specimens taken from Messrs. Paterson Brothers' crop at Pinjarra, when the plants were half grown, depict plainly the normal and diseased plant, and even at that stage the restric-

Potato Plant, showing Mosaic Infection.

tion of the size and number of tubers is most marked. Naturally the most important point to the grower is by what means he can eliminate this very grave danger, which the writer has no hesitation in saying will, without prompt and determined effort on the part of the men most interested, very soon spell the doom of the "Delaware."

Nothing more than thorough and systematic selection of high producing roots from seed from normal healthy plants, showing none of the characteristic crinkle in the leaf during growth is necessary, and, after all, this calls for no great outlay or expenditure of energy.

Early winter planting is greatly provocative of "Mosaic," and should be avoided where at all possible, as wet and cold provide those conditions under which it does the maximum amount of damage. Summer conditions and high temperatures keep the disease dormant.

It was very noticeable in the comparatively few really good crops just harvested that growers who had been even moderately careful over their seed selection had very little infection generally, but "Mosaic" always occurred worst in the earliest planted portion, and the later the planting the heavier the yield—up to actually double in several cases.

Should growers benefit from this season's experience and go "bald-headed" for only high yielding roots in future for seed, the lesson will be well learnt.

Mr. Clarke's crop at Burekup.

Top Dressing the Winter Crop.—An interesting comparison is afforded in illustration No. 4 of portions of Mr. C. L. Clarke's crop at Burekup, which is due to top-dressing with sulphate of ammonia at the rate of 1½ cwt. per acre, applied just as the plants showed in rows.

The difference was very marked at the time of photographing, and what appealed to the owner more nearly, yielded 2½ tons better on the top-dressed portion at digging time.

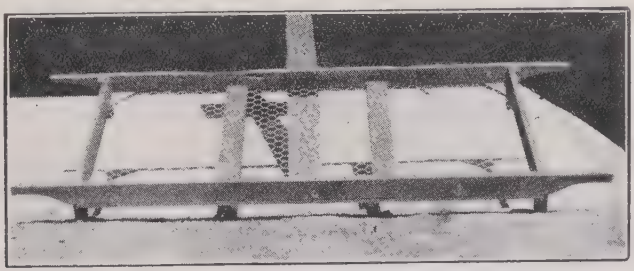
Where unsprouted seed is planted under "general crop" conditions it is quite usual for the seed to remain six to eight weeks before breaking ground. In these circumstances a big proportion of the nitrogen in the fertiliser undoubtedly has gone before the plant requires it, about three weeks after showing through.

Consequently the practice of using sulphate of ammonia as a top-dressing is becoming more general for this planting. The probability is that the practice of one large grower of distributing super only in the furrow at planting, and the application of the nitrogen in the form of sulphate of ammonia or nitrate of soda as a top-dressing later is sounder and more economical. For the quickest action nitrate of soda is of course preferable as the nitrogen so contained is at once available to the plant.

Dipping of Seed.—Whilst the dipping of seed potatoes is most advisable as a prevention of common scab and "rosette," it is not at all general. It is quite remarkable to find amongst those growers who do dip, by far the greatest number are only allowing immersion for 20 minutes to half an hour for either formalin or corrosive sublimate, when the correct time is 1½ hours at a strength of one pint of formalin to 30 gallons of water, or 4 ounces of corrosive sublimate to a like quantity of water. The latter chemical, being in crystal form, is much more readily dissolved in hot water first.

In the case of formalin, which is a perfectly safe chemical to handle though not quite as effective as corrosive sublimate, it is not necessary to renew or add fresh solution, which is imperative with corrosive sublimate. This point is very often overlooked, and the treatment condemned through lack of care or ignorance.

Racking of Seed.—South-Western growers might well take a leaf from the book of the more careful men in the Albany district over the treatment of seed which they are holding for the next planting. Illustrations Nos. 5, 6, 7, and 8 show racks belonging to the Potato Branch which are an adaptation of the Albany idea, and which will hold a bag and a half of seed each, and are in use for seed designed for the experiments in the various districts.



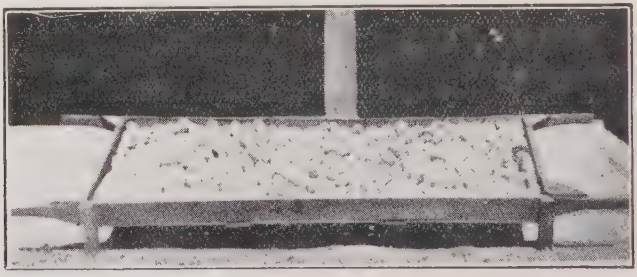
A Seed Rack.

Illustration No. 5 shows the rack itself, constructed quite cheaply of 4in. x 1in. jarrah and 2in. mesh netting, with 2in. x 2in. legs with a clearance of four inches. This rack is very easily handled, and can be stacked readily anywhere out of the direct rays of the sun, and simplifies the inspection of seed to the greatest degree. The racks, in the case of the treat-

ment accorded by this Branch, soon after the operation of filling, are placed holus bolus into a tank constructed to contain it and left there for 1½ hours in the formalin dip previously described, and then lifted out to drain, and followed by the next and so on. A great saving of time in both dipping and "picking over" results, as any faulty tubers are detected at once and eliminated.

Tray containing Benger Seed dug in May.

Illustration No. 6 shows Benger seed dug in May, hardened and "greened" and bearing robust sprouts, and is a portion of the seed to be planted at Young's Siding experiment the second week in December. Exactly similar seed planted in July at Burekup has produced a crop from which the tubers in Illustration 7 have since been drawn, demonstrating clearly how perfectly seed may be held under this system if so desired.



Tray containing Seed selected by Inspector Collins.

The seed in Illustration No. 7, and other similar to it, was all "root selected" at digging time by Inspector Collins and will, with the exception of what it is necessary to cut for purposes of the germination trial, be planted whole in Benger in January.

The planting of whole tubers of this size is designed to ensure, as nearly as possible, maximum germination so necessary for correct results in experimental work. When the wet bag treatment of seed, described below, has been proved successful quite definitely, cut seed will of course be used as being more economical.

Cut Seed treatment for summer planting.—A reminder of this to growers is seasonable, having first been mentioned in a previous issue of this Journal.

Based on the results of an experiment run for five years at Rothamsted, in England, the indications are strongly in favour of cutting large seed—preferably "root selected" of course—into wet bags for from 24 to 48 hours prior to planting. This treatment is provided to allow of the cut surface healing or callousing over slowly in a warm moist atmosphere to ensure the proper and complete development of a protective covering called suberin, which guards the inner tissue of the "set" from fungal and other disease

Method of stacking Racks.

attack. The thought behind the old and obsolete practice of dusting the cut surface with lime or ashes is similar of course, but this is not effective. Seed cut and planted at once in the early morning before the soil heats up is also a method adopted with certainly more success than dusting, but even here germination results are inconsistent.

Rather than plant "round seed" (a correct term for which is "culls"), it will pay the careful man much better to plant whole large tubers if he is planting a "stud seed" plot this summer, from selected stock, and is at all doubtful of the wet bag treatment suggested.

EXPORT OF EGGS.

W. T. Richardson,
Poultry Adviser.

The export season has just closed, during which 13,132 cases of eggs, the product of Western Australia, have been shipped to London. Each case contained 15 dozen, representing a total of 196,980 dozen eggs.

Compared with the two previous seasons, *i.e.*, exports for 1924, 18,045 dozen; 1925, 38,600 dozen, this year's shipments are over five times in excess of previous records, a very creditable performance indeed, and the result of organisation on the part of poultry farmers. Those poultrymen who have not contributed so far to the export would do well to ponder over what would have been the state of our local market and incidentally their own position had these eggs, in excess of 2¼ millions, remained in the country.

THE ESTABLISHMENT OF USEFUL FODDER PLANTS AND ELIMINATION OF WORTHLESS SCRUB.

Paper submitted by A. B. Adams, Dip.Agr., Department of Agriculture, Perth, at meeting of the Australian Association for the Advancement of Science, entitled "The Establishment of Useful Fodder Plants and Elimination of Worthless Scrub by the use of Phosphatic Fertilisers on Phosphorus deficient Soils."

The results to be obtained by the use of phosphoric acid on grazing lands are now considered of economic importance in all countries where agriculture has advanced beyond the mere primitive stages, and probably in no country are they of greater interest than in Australia. Their importance to Western Australia is greater still as, at a rough estimate, there is an area of 12 million acres with an average rainfall of 25 inches per annum, a very large percentage of which can be improved in regard to its stock-carrying capacity by the application of phosphatic fertilisers.

As pasture is one of Australia's principal crops, any method that promises a ready and inexpensive means of establishing it should justify examination.

The actual method by which the results given below are being obtained is very simple, as all that is really necessary is to sow suitable seed on the surface, and manure with a suitable phosphatic fertiliser. Almost everyone is familiar with the results that can be obtained by the use of water in an arid district, the change appearing like magic. Equally striking results are being obtained here by the use of superphosphate on soils where a deficiency in available phosphoric acid is the limiting factor in production.

This is really an instance of the law of the minimum; it is not merely that the yield of a crop is governed by the constituent in least supply, but that in nature when the struggle to survive is governed by soil and climate without interference from man, those plants with a low requirement of any factor will, if the factor is deficient, occupy the soil to the exclusion of plants with a higher requirement. In the case of water, everyone realises that however rich the soil a plant cannot grow unless its minimum water requirements are supplied, and the types of plant life found in any locality are to a great extent determined by the water supply. Much the same effect will be noted whatever factor of growth is concerned, whether it be water, temperature, the mechanical condition, or some chemical constituent of the soil. So far as climatic conditions are concerned, it is a fact generally acknowledged in practice, but is not so generally realised in relation to the mineral constituents.

In agriculture, the practical application of the statement is first to determine the factors that are deficient for any given crop. When we know this, we can then proceed to supply the crop requirement if that is practicable, if it is not economically possible, we can decide not to attempt to raise crops which we know cannot flourish in the circumstances.

Much time and money have been lost by pioneers in attempting to grow crops under unsuitable conditions, because they did not realise that the attempt to grow a plant in the absence, or grave deficiency, of any single re-

quirement of that plant, was fore doomed to failure. In older settled districts these losses are not so common, as repeated trials have discovered which crops can be raised at a profit.

We know that deficiency in available phosphate is a characteristic of many Australian soils, and this is so in the South-West of our State, but all soils in the area are not equally lacking in this requirement, and I feel confident that the difference has a bearing on the early history of settlement.

From the statements of early settlers the native vegetation varied from natural grass country with a few big trees to the acre to areas of harsh innutritious scrub; the latter being usually more densely timbered. The pioneers of that time pushed out to comparatively long distances from towns,

Photo. of Subterranean Clover paddock from which specimen No. 2 was taken.

and the seaboard, and settled where there was natural feed, grazing being their chief occupation. There was but little cultivation, and that solely for their own requirements.

It would appear that the better grassed country was that naturally richest in phosphates, for when first settled the grazing was good. Old settlers aver that in the early days bullocks of 800 to 1,000 lbs. dressed weight, off the natural feed, were fairly common. With constant grazing many of the better grasses disappeared, the rougher scrubs tended to invade these areas, and there was a big increase in the number of trees to the acre, much of the park-like country becoming dense forest.

Various explanations of this increase have been given; that of bush fires germinating the seed being a favourite one. My own theory, which is an attempt to find reasons for the difference in the growth before and after settlement, I give for whatever it may be worth, and will endeavour to show that the real reason was the depletion of phosphates on the better soils where originally there had been good grazing, and the chief reason for the

scrubby growth and absence of grass on the other areas was the grave deficiency in available P_2O_5.

Timber was not so dense on the better areas in their original condition, because of the heavy growth of grass which was probably burnt periodically by the aborigines, and gave a fire hot enough to destroy many of the seeds and to kill any small seedlings.

There has since been an increase in the number of trees to the acre, because—

(1) The tree seeds were trodden into the ground, and so planted by the stock;

(2) the land was overstocked, and the grass eaten out;

(3) the soil not being really rich in phosphate it was soon depleted, and would not longer support a luxuriant growth of grass.

Practical men who really understand their local conditions unconsciously act on this when they say that it pays to ringbark the timber on the better soils, because you get feed and the land practically clears itself, but it does not pay to ring the poorer land, as all you get is a crop of seedlings and suckers.

This is an average of the growth over several acres. Photo. Aug., 1925.

This is undoubtedly true, and the reason for the widely different result of ringbarking is that the better soils are richer in P_2O_5; this is taken up by trees, and the fire that goes through after ringing, burning up the leaves and smaller branches, leaves ash comparatively rich in P_2O_5, which acts as top-dressing to the grasses which are always present on the better soils. This good growth of grass can again be burnt the next season, killing any seedlings that may have germinated, and in time these grass fires with a small amount of assistance from man will clear the land.

On the poorer soils the ash after the burn is not rich in plant food, also there are but few grasses and quick-growing annual plants to respond even if it were, consequently it takes at least three years before a second fire can be sent through, and then it will not be a heavy burn. In that time any

seedlings will have made so much growth that a light fire is unable to do them much injury, and so instead of the land clearing itself it gets a thicker growth of trees and scrub than it had before.

For our purpose the wet South-West may be classified as—(a) natural grass country, and (b) scrub country, which has a little value for grazing when newly burnt, but it can only be burnt about every three or four years.

On the natural grass country the use of phosphate increases the bulk of the feed.

In addition to increasing the bulk, the ash content is improved, as shown by Mr. Baron-Hay in an article in the Journal of the W.A. Department of Agriculture for June, 1926.

This improved ash content has been proved to be very important in nutrition, as shown by Mr. Walter Elliot and others in the Journal of Agricultural Science, January, 1926.

It is now proposed to deal with actual results on the scrub country. The specimens described below illustrate what can be done to change the character of the growth of vegetation by simple and inexpensive means, once we grasp the factor or factors necessary to achieve our purpose. It will be noted how the scrub has disappeared or is disappearing, and though it may be difficult to realise, it is nevertheless a fact, that some varieties of trees—banksias in particular—are very sensitive to changed conditions, and are also dying.

Description of Specimens.

No 1. Red gum, flooded gum and blackboy, land. A crab-holey clay. Sods from Mr. David Marriott, Brunswick, showing—

(a) Natural growth of short wiry rushes, no clover present.
(b) Result first season after sowing subterranean clover burr on (a), and manuring with one bag of superphosphate per acre. A few plants of clover and rushy growth still flourishing.
(c) Second season been top-dressed superphosphate. A vigorous growth of subterranean clover: rushes disappeared almost completely.
(d) Third season: no rush or scrub to be found.
(e) Third season of grass on similar land. In this case ground had been cleared, ploughed, and cultivated before sowing clover, but third season growth no better than specimen (d).

No. 2. Red gum, jarrah and blackboys. A sandy loam overlying clay. Sods from Mr. C. C. Leitch, Boyanup, showing—

(a) Natural scrubby undergrowth, chiefly so-called native buttercup, a little kennedya, but no clover present.
(b) Result of sowing on (a) early in April, 1925, 2 bags of Subterranean Clover swept burr and one bag superphosphate per acre. This season (1926) the scrub is almost entirely suppressed, and there is a good pasture of subterranean clover established.

No. 3. Banksia with a little red gum and jarrah. A light sand with some humus in the surface layer of soil. In this case no seed was sown, dwarf plants of trefoil, etc., being present, but last season before fertilising with superphosphate the scrub was healthy and vigorous. After fertilising the clover came away, and this season the clover is thick and healthy. Specimens from Mr. Stanley Frome, Picton.

The clovers are chiefly subterranean and yellow suckling, and they are healthy and vigorous. The scrubs are a so-called dwarf banksia (*Beckea camphorismae*), a plant with a large woody root system, and this plant is dying as a result of the treatment. The other is one of the ti tree scrubs (*Dryandra nivea*), and although not definitely dying it is weaker otherwise similar plants where the ground has not been fertilised.

It was not until the introduction of phosphatic fertilisers that any attempt was made to grow crops on these poorer soils, and usually it was thought necessary to kill the scrub by ploughing and cropping for some time before it would be fit to grow grass. After this treatment fair to good pastures were established.

It is well known that this comparatively expensive treatment will give the desired result, but to rapidly bring large areas under grass a cheaper and more expeditious method is desirable.

I will briefly outline the method to be followed, and attempt to formulate the reasons for the results obtained.

If clovers are present, as is often the case, on the run-down better soils, it is really only necessary to distribute superphosphate at the rate of 100 to 150 lbs. per acre to get an immediate response.

On the scrub lands very often there are no clovers or trefoils present, it is then necessary to sow seed as well as the manure, the best time being with or shortly after the first autumn rains. It is generally best not to sow until the timber is dead after ringbarking, and if the undergrowth is very heavy it may be necessary to chop this down and fire it; but in actual practice it would almost appear that there is greater danger of doing too much rather than too little preliminary work.

The first season stock should be kept well off the paddock until the clover has had a chance to seed. Afterwards the paddock may be stocked, and if regularly fertilised with phosphates, it will be found that the feeding value of the land will be multiplied many times, and that the worthless scrub will become very weak or entirely disappear.

We may briefly summarise thus:—

(1) There is a vigorous growth of useful fodder plants.

(2) The stock carrying capacity is greatly increased.

(3) The scrub disappears, because—

(a) the more edible scrub is eaten as a change;

(b) the treading of the stock consolidates the soil, and causes the scrub to die by changing the conditions.

In conclusion, the above is an outline of an economic method of soil improvement, which has the great advantage that no very great capital outlay is required. It is also an attempt to formulate a theory for the observed results. It is at present practised on a limited scale by a few men who are scattered throughout a large area, and who have independently arrived at the same idea, but in many cases their neighbours are now awake to its advantages, and in one district alone I believe that a large area will be sown this coming season.

It should be noted that the term "grass" is used to cover not only the true grass, but also the trefoils and other useful fodder plants.

COTTON.

By the Editor.

Few people, not having some intimacy with cotton cultivation, realise in the plant one of Nature's most beneficient gifts, or recognise in it a combined source of food and clothing. In a lecture given by Mr. J. D. Young, an officer connected with the British Australian Cotton Association, Limited, some time ago, valuable information on the importance of the cotton crop was stressed, and from this lecture the more salient features have been epitomised and incorporated into this article for the benefit of those readers of the "Journal of Agriculture" whose interests incline in that direction.

It is of first importance to remark that in the past the growing of cotton has played a prominent part in the development of national life in many countries. Down the long corridors of time that country which for the period controlled the cotton market has dominated the markets of the world. The history of cotton recedes into the dim and distant ages. A Greek historian has traced it back to India 2,500 years ago, but it is more than possible that long ere this China, the mystical and unfathomable ancient of nations, claimed it amongst her products.

As civilisation has progressed, so has the demand for cotton increased, while later-day developments of the by-products from the seed have reached a high stage of development. It is estimated that there are in the world to-day some 500,000,000 people who are but partially clothed, and a further 250,000,000 entirely without raiment as we know it. Bear in mind also that the greater proportion of the inhabitants of Europe and America cannot indulge in the delectable butter common to our Australian tables but have to depend on the less nutritious synthetic substitute commonly known as margarine, a manufacture of the extract oil of cotton seed. In Australia, as elsewhere, this oil has also a considerable vogue for culinary purposes, and to further add to its commercial value it has a high demand for soap-making and lubricating, while the seed residue forms a most valuable concentrated stock food.

In a country such as Australia with its immense flocks of sheep and huge cattle stations, supplying wool and mutton and beef for the sustenance of a comparatively meagre population, these facts may at first sight appear of no more than passing interest, but the subject has a deeper phase. Cotton is woven into the industrial progress of the country. It is the foundation of innumerable secondary industries which follow the establishment of the culture. Cotton lint is the basic article in the largest manufacturing trade in the world. Spinning and weaving mills, the dye industry, and the intricate machinery necessary to all these trades, with a host of minor industries and other services allied to the textile trade follow in the wake of the cotton plantation. It has been estimated that 8,000,000 of Great Britain's population derive a livelihood from allied industries of the cotton trade, and cotton-growing proved one of the biggest factors in developing the great American continent. Its ramifications have, therefore, a far greater significance than the mere supply of food and clothing, in a land where want is practically unknown, and the march of time tends to multiply the uses to which the lint is put. Motor tyres, for instance, and insulation for electric wire depend upon the fabric for their manufacture, and each day one is accustomed

to handle cotton in some of its varied forms. The whole production of Queensland is practically absorbed by one manufacturing firm alone, and the supply has not proved equal to the demand.

To-day the cultivation of cotton encircles the globe. It is a tropical and sub-tropical plant, and that it can be successfully grown in Australia has been demonstrated in Queensland. The difficulty of the cotton farmer seems to lie in the harvesting rather than cultivation. In America the employment of slave labour, prior to the great day of Emancipation, helped to solve the problem for the early settlers. Under present day conditions, and in this country it is postulated that the embryo farmer would do well to confine his operations to such acreage as can be harvested by himself and family, the employment of outside labour presenting difficulties calculated to take from the grower any appreciable return. The days of indentured labour have passed, and the aborigine of this country has not proved himself adapt-

Grading bales of Cotton.

able to the consistent expenditure of human energy necessitated by this kind of work. Assuming that cultivation of the plant took hold in the Commonwealth, it seems reasonable to suppose that the benefits would materalise more in the secondary industries than the primary, and a welding of the financial interests of the grower, the ginner, and the manufacturer would seem to be a *sine qua non*. It behoves the prospective cotton farmer, therefore, to hasten slowly and consider well the risks involved in the enterprise upon which he is disposed to embark.

Given a suitable climate, good rains at planting time, light rains during early growth, and good rains again at the fruiting season, the culture demands no great worry, and involves little more trouble than in growing a crop of maize. The best soil is a fairly rich light loam with a clay sub-soil. Heavy soil is not suitable for cotton culture. While there should be a fair amount of humus, the soil should be easily worked, friable and moisture-retentive. The seed is planted after the manner

of maize, but sown more thickly in the drill, then thinned out when the plants reach four to six inches in height, leaving them 15 to 20 inches apart. Fortunately, Australia is so far free from Boll Weevil, one of the greatest pests with which the cotton-grower has to contend. The caterpillar pest is, however, indigenous to the country, and causes havoc in the cotton crop, as it has done with maize. The method of combating this pest, as laid down by the Queensland authorities, is to sterilise all seed before it is sent out for planting, and the Government there is carrying out experimental work in treating plants with poison sprays.

The cotton market is said to be one of the most reliable in the world, and on many occasions there has been a marked hunger for the commodity.

The cultivation of cotton in Queensland dates back to 1860, and a decade later the area cropped was over 14,000 acres. After the termination of the American Civil War a severe set-back was given to the industry in this country, and it was in 1913 that the Government undertook an advance of 1½d. per lb. on seed cotton produced, and in 1922 and 1923, owing to the high prices ruling in Europe the Government of Queensland undertook the responsibility of giving a fixed price of 5½d. per lb. to growers of seed cotton produced in that State, and made all arrangements for handling, ginning, and marketing the crop.

In rendering assistance to the cotton industry the Government of Queensland has worked in conjunction with the British Australian Cotton Association, Limited, a big company concern which has established six ginneries, the largest being at Whinstanes (Brisbane), and smaller plants distributed at Rockhampton, Gladstone, Dalby, Gayndah and Woowan. In the initial stages of the industry the Government acquired the whole of the cotton crop, paying the company an agreed price for ginning and baling, and conceding it the right of purchase of all by-products of the seed, the lint remaining the property of the State until disposed. This undertaking, however, terminated at the end of June last, when the growers contemplated the formation of a Cotton Pool Board under the Primary Producers Act of Queensland, the members to be elected by the growers themselves, thus ensuring absolute control of their crops. A bonus has since been obtained from the Commonwealth Government, fixed approximately at 1½d. per lb. on cotton seed produced and 6d. on manufactured yarn.

The works at Whinstanes comprise a very complete modern plant, equipped with the most up-to-date devices for carrying on the business. From a siding running into the ginnery from the main line, the bales of raw material are received into a shed, where the contents are graded by Government inspectors, separated into various classes and weighed. Particulars of the quantity, quality, and the owner's name are then entered in a receiver's sheet. Dumped to a floor worn smooth and glossy from repeated contact with the bales, they are delivered to a species of pen, midway in which and hard up against the wall of the building, is fixed a huge bell-mouthed suction pipe. Here the harvested cotton is unpacked and fed to the pipe, and every precaution has to be exercised in seeing that only cotton enters the adit. Curious instances are related of various articles rescued from this airway to the cotton gins. Billies, knives, lunch bags, watches, tobacco, wax matches, and all sorts of things have been detected and separated from the bales. One can imagine the damage that might ensue following

upon a live match accompanying the cotton in its course through the suction pipes which extend across yards and through buildings on their way to the cotton gins.

After being thoroughly cleansed the cotton is fed by conveyor belts to the gins. Each gin consists of a cylindrical housing around a smaller cylinder scored with numerous narrow apertures, out of which partly project fine-toothed circular saws, clutching the cotton seed in its passage and rasping off the lint, the apertures being too small to admit the seed. An air blast

The suction elevator.

continually passing through carries off the lint, whilst the falling seed is swept by a series of brushes, revolving on the Archimedean screw principle, to receptacles from which travelling belts transport them to another part of the factory. The lint is removed by air blast, through channels, to what is known as a condenser, and from there pressed into bales by an ingenious mechanical contrivance having two compartments, which automatically performs the work of filling and pressing. Whilst one bale is in course of preparation the other is being sewn up and removed. Each bale is held by six wires, the ingenuity of which represents the genius of a Queensland student during the war period, whose invention is, in effect, a wire reef knot in which both the loops are made prior to their being joined together. When

these have been loosely fashioned around, the bale pressure is released and the subsequent expansion strains against the wires, with the result that the finished bale is as hard literally as a block of wood. It is then branded with its grade and other particulars, and ready for shipment. The aim of the operator is to get a bale containing 500 lbs. of cotton, but this is dependent on weather conditions, which have a varying effect.

Seed which is selected for planting the next year's crop is conveyed from the ginning room to an adjoining storehouse, and heated in a Simons' steriliser to 160 degrees F. This machine acts in a similar way to a dough-mixer, constantly revolving and exposing each seed to full benefit of temperature, ensuring the destruction of such germs as may be present. The seeds are afterwards bagged, and a sample taken from each is subjected to a germination test before the contents are premitted to be sent out to the farmer.

Seed that is required for oil extraction is first passed through jigs to cleanse it of all dirt and refuse matter. It is then further delinted, the resultant material being known by the trade name of "Linta," which was at one time sold to undertakers. It would, however, as remarked by a guide at the workshops, have required a perennial epidemic to absorb a small portion of the output, and it fortunately has now a high demand for furniture and motor car upholstery. There is accommodation for 4,000 tons of seed in the storehouse at Whinstanes. After delinting, the seed is fed to revolving rollers, which break the shell and separate it from the kernel. The latter is then crushed to the consistency of rolled or flaked oats, made into cakes about one foot by two feet oblong, wrapped in camel hair cloth and thoroughly cooked in steam ovens. When they are withdrawn the cakes are submitted to a very high pressure to secure a complete extraction of the oil. After removal from the presses an interesting operation follows. On a near by table is one of those simple yet wonderful pieces of machinery which seems to be almost human in its dexterity. A roller set with spikes or fingers is caused to turn half over and then reverse, twice, thus passing the package over and under itself, in the course of which the fingers take hold of the ends of the cloth and neatly divest the cake of its covering, passing it forward to another machine, where the surface is cleaned off and the cake either converted to meal or broken to cubes for cattle fodder, according to which ever manufacture is on order.

Meanwhile the oil has been pumped to a storage tank from which it is gravitated to settlers, and in its crude state has a thick consistency, cholocate in colour with a golden brown froth super-imposed. In the course of refinement it is treated with Fuller's earth, caustic soda, and hot water, which remove all traces of saponifiable substances, and it is finally dried out by a vacuum process. When purification is complete the oil is a beautiful clear amber colour, free from all extraneous matter. The product is then conveyed by pipes to the packing room, where petrol tins or barrels are automatically filled by an electrically controlled machine. As in the case of the Queensland Jam Factory, everything, as far as practicable, is carried out by mechanical contrivances, so that there is no waste labour, and the work of the employee appears to call more for care and skill than expenditure of energy. In the filling process for instance the container passes on to a balance, which causes the oil to flow from the pipe to the vessel, but immediately the requisite weight of oil has passed into the tin the weight drops the balance

and cuts off the flow, the container then passes to an electric soldering machine, where expert hands adeptly perform this operation and the manufacture is ready for despatch.

Whatever future awaits cotton culture in this State, wisdom dictates that desire shall not overrun discretion. Soil, climate, and economic problems require careful thought and investigation, and premature conclusions are to be avoided. It is well to remember that the cotton belt in Queensland has a rainfall ranging from 25 to 40 inches per annum on its western edge, and the greater part has an average of 30 inches annually. The planting season is from August to November, and in some sections very little rains fall during that period, belating planting and causing the owner to incur risks of getting no return for his labour. This, however, has been minimised by adopting fallow farming. During the past six years Queensland has continuously increased its acreage and harvest of cotton from 1919, when 72 acres produced 27,470 lbs. of unginned cotton, until 1924, when the acreage sown was 50,186 with a return of 16,416,170 lbs. According to the official "Year Book" of the Commonwealth for the year 1925, the estimated acreage is 35,000, with an anticipated yield of 18,322,103 lbs., which predicates a much better yield per acre.' As already pointed out, however, what applies to Queensland does not necessarily apply to our own State; each must stand upon its own merits, and until much water has flowed under our bridges, and the adaptability of our soil and climate has been proved, let inclination wait upon prudence.

NOTES ON THE PASTORAL INDUSTRY.

Hugh McCallum,
Sheep and Wool Inspector.

Western Australia has a great opportunity to establish further the pastoral industry. The climatic conditions are such that sheep will do well in all parts and grow wool of high commercial value in the South and the North, and as our lands are sparsely stocked, large areas of country are available for wool-growing. Nowhere is land cheaper than in Western Australia. The great wheat areas of the State must in a few years add to the numbers of our flocks, for those on the present wheat belt are yearly increasing and will continue to increase as improvements are made.

All these things are making the demand for stock keener than it ever has been before. The prosperity of the State comes from primary productions. The pastoralist and the mixed farmer are going to make this large, partly undeveloped State abound with prosperity. At present mixed farming is a big asset. What will it be in future years?

Owing to the State having such a variation of climatic conditions, one type of sheep will not be suitable for every locality, and, as a result, sheep-owners in the South-West portion should study the climate and breed accordingly.

The history of wool-growing in Western Australia is brimful of interest, and the story of the early pioneers who blazed the trail in the great North-West is one of hardship. However, in spite of many obstacles, this State is forging ahead, and to-day the position is sound and the future is full of promise. The early breeders gave attention to improving the flock by selection, and every flock gave thought for improvement. Importations from the best flocks in the Eastern States were used to build up our flocks, and after years of careful attention the experience gained has resulted in our attaining high class stud flocks throughout the State and breeding rams to supply the wants of the station. The policy of wool growers is still further to improve the flocks. It is really the studs that maintain the standard of our wool production, and our successful breeders are men who have made a life-long study of their business, and know what they are aiming at, and keep it in view all the time.

The bulk of the wool grown in Western Australia is sold at our up-to-date wool stores. In these days of diminishing numbers of flocks in many parts of the world, it is satisfactory to see in this State the increasing number of sheep and return of wool per head. The great wheat belt areas pasture yearly more sheep as the country becomes improved. Our asset in sheep and wool is of considerable value, and to what it is likely to increase within the next few years is hard to estimate. No part of Australia offers a greater return for capital invested in land than Western Australia. Here, opportunities are available for all who make this State their future home, and in no industry are the prospects brighter than in sheep and wool.

EARCOCKLE (*Tylenchus tritici*) AND A BACTERIAL DISEASE (*Pseudomonas tritici*) OF WHEAT.

W. M. Carne, F.L.S.,
Economic Botanist and Plant Pathologist.

EARCOCKLE.

Though not one of the more important diseases of wheat in this State, Earcockle is found every season to a small extent, mainly on the Merredin-Dowerin and Wongan Hills lines, and in the Northern Wheat Belt generally. The first authentic record of its occurrence was published by R. Helms in the "Producers' Gazette of Western Australia" in 1898.

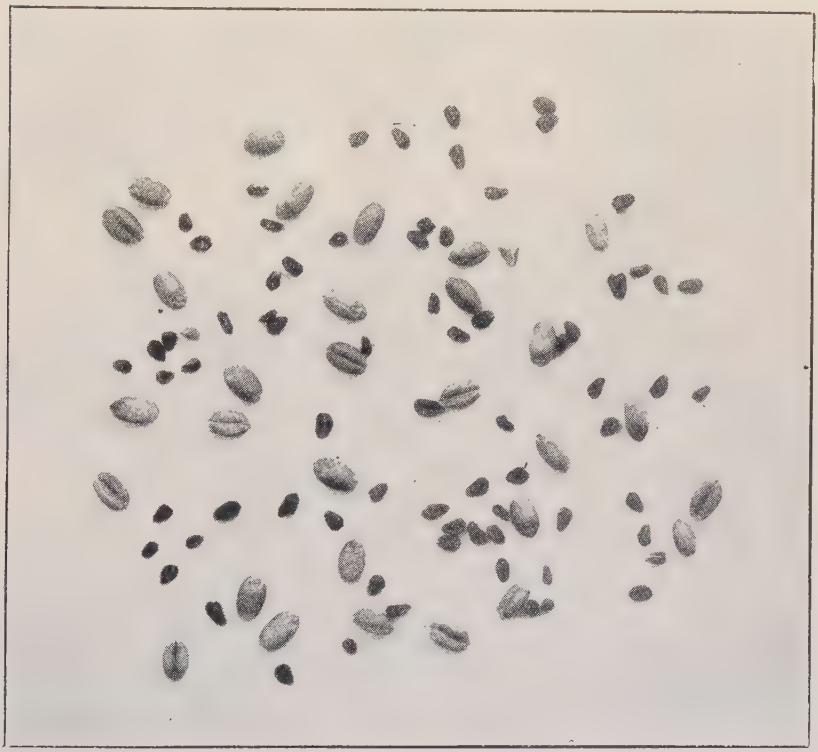
Earcockle directly affects the growth of wheat plants, and may even kill them as seedlings. The symptoms may be very marked, or so slight as to be overlooked. They are more distinct on young plants than those approaching maturity. Affected plants are dwarfed, and the leaves become twisted and wrinkled. This prevents the younger leaves within from emerging normally, causing them to be buckled and the stems to develop a characteristic curve between the nodes (joints). When heading time comes the twisting of the leaves makes the emergence of the head difficult, so that it may become bent and caught by its tip, especially if tip-awned. However, the early symptoms may largely disappear and the upper leaves and heads may appear normal.

Heads on affected plants may be distinctly abnormal, or may only differ slightly from unaffected heads. There is a tendency for affected heads to be shorter and appear broader, and to keep green longer than those which are healthy.

The grains in a diseased plant are replaced to a greater or lesser extent by Earcockles. All the grains in an ear may be replaced or only a few. Occasionally no cockles are developed. All heads on a plant may be affected, or some may be affected and some sound. Investigations by Leukel, in the United States of America, showed that the loss of grain may exceed 70 per cent. The actual loss depends upon several things—the number of seedlings killed, the reduction in the number and size of heads produced, as well as the loss of grain replaced by cockles. The amount of infection and consequent loss depends upon the number of cockles available in the soil to infect the wheat. Losses exceeding 50 per cent. have been noted in this State over areas of about an acre. There is, of course, the further loss in the dockage imposed on wheat containing cockles.

The cockles are hard dark brown, almost black, bodies somewhat resembling a seed, and receive their name from a supposed resemblance to the seed of the European Cockle Weed (*Agrostemma Githago*). Cockles may be confused with smut balls, but unlike them are hard and not full of black dust. They are easily recognised when first formed, for if an affected flower is opened, a smooth green body is found to replace the white immature seed, and there are no stamens or feathery styles. The cockles vary considerably in size. They are shorter than wheat grains though wider in proportion. Cockles are sometimes formed on leaves, but this has not been noted in this State. If the interior of a cockle is examined microscopically it is found to contain thousands of minute worms (nematodes). Placed in water these soon become active.

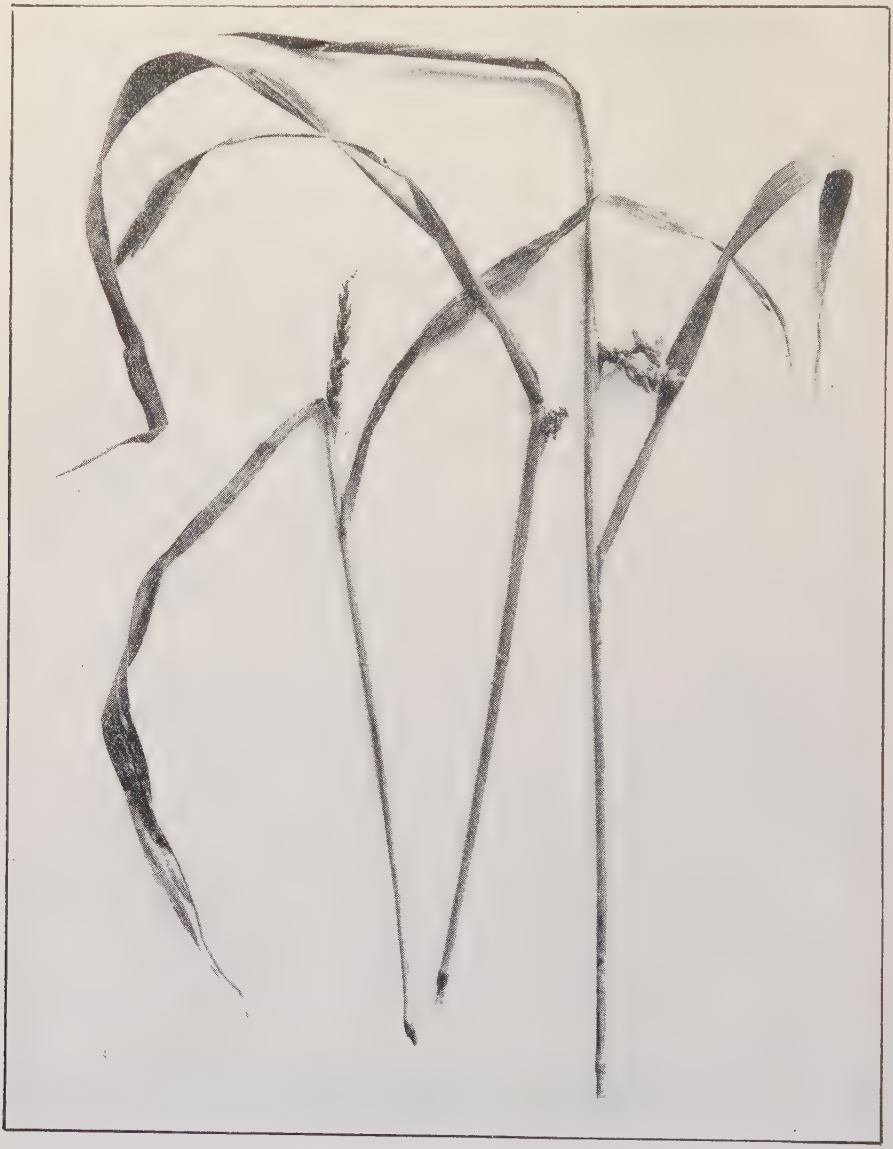
Infection of wheat takes place from cockles in the soil within a few inches of the growing plant. If sown together the galls take longer to release their contents than the wheat grains to germinate. Apparently the wheat plants may be attacked by the worms from the time the white sheathing (coleoptile) of the first shoot becomes loosened, *i.e.*, after the first two or three green leaves have appeared, until the stem starts to shoot. By some unknown means the worms reach and penetrate the top of the stem, being carried up with it as it heads. They enter the immature seed (ovary), mate and lay eggs, which have given rise to worms by the time the altered seed (cockle) is mature.



Wheat grains and Earcockles.

Kept in a dry place the worms in the galls retain their vitality for at least eight years. Fortunately in the soil they do not live more than one winter in our climate. Thus, if a fallow, or a crop of oats or barley which are practically immune, or of peas, or any plants not wheat or rye, is interposed betwen two crops of wheat no infection from the soil is likely to take place. This has been often demonstrated in this State. Indeed serious infection with Earcockle is usually associated with continuous wheat cropping, especially about the sixth year or longer. The only danger of infection on a soil which did not grow wheat the previous seasons lies in the sowing of grain containing cockles. This, of course, is something of which no farmer who knows his business would be guilty. It is possible to remove

the cockles from wheat by stirring the grain in a solution of salt and water (20lbs. in 10 gallons), and skimming off the cockles which float on the surface. The grain has then to be washed in fresh water, spread out to dry,



Bacterial Disease of Wheat associated with Earcockle.
(The affected heads are bright yellow.)

and sown as soon as possible in a damp soil. It is much better and safer to use clean grain. This can be secured by sowing on selected fallow each year an area for grain, obtaining the seed from an experiment farm, or other reliable source.

Wheat Plant with Earcockle and Bacterial Disease.
(Note the curving of the stems due to Earcockle.)

BACTERIAL DISEASE.

In 1923, and again in 1925, a disease associated with Earcockle was found at Yelbeni. This was identified in 1925 as a bacterial disease, due to *Pseudomonas tritici*, described by Hutchinson, in India, in 1917. It has been known in India since 1911, in Egypt since 1912, and quite recently in Western America. It has not previously been recorded from Australia.

The disease is characterised by the development of a bright yellow slime on the abortive ears and the leaves in contact with them. It is developed on the ears while still in the boot, its presence being recognisable by narrow white flecks on the upper leaf blades. The slime becomes quite hard and brittle when the heads have been out a few days. Otherwise the plants have the general symptoms of eelworm attack. Laboratory and field work indicate that the bacteria are carried into the plants by the eelworms. The effect of the attack is to destroy the heads so that no grain is formed, and the loss is complete. It is interesting to note that no cockles are formed so that the worms are the agents of their own destruction. The evidence available, though not yet complete, indicates almost conclusively that the bacteria are unable to directly attack the plants. It is obvious that the control of cockle equally controls the bacterial disease. Where the disease occurs not every plant with cockle is affected, and there are produced sufficient cockles to carry on the disease if wheat is again planted in the following season.

Field experiments at the Merredin Experiment Farm this season showed that both cockle and the bacterial disease are readily spread by water lying on the ground after heavy rain. Otherwise the experiments supported the evidence from other sources that the worms cannot of themselves travel more than a few inches, and that the bacteria are harmless except when the worms are present.

SUMMARY.

Earcockle is a minor disease of wheat caused by a parasite nematode worm.

Infection results in the death of seedlings, dwarfed distorted plants, and a reduction in yield and grain value.

One year without wheat or rye will ensure the death of cockles in the soil.

Earcockle is prevented by sowing clean seed in clean ground.

A bacterial disease is associated with Earcockle, resulting in the total failure of affected plants to form grain.

It is controlled by controlling Earcockle.

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FRUIT FLY.

(*Ceratitis capitata*)

TRAPPING OR LURING EXPERIMENTS.

L. J. Newman, F.E.S.,
Entomologist.

During the past winter and spring an experiment has been in progress for the purpose of further demonstrating the fact of the over-wintering of the female fruit fly, and to prove the effectiveness of trapping during this period.

The test was commenced on the 2nd May, 1926, and terminated on the 23rd November, 1926, a period of six months and three weeks.

An exceptionally wet winter and spring have been experienced, rains being frequent and heavy throughout. During this time it is not possible to maintain systematic and regular foliage baiting, owing to the frequency of rain, which washes the bait off. It is, nevertheless, advised that any fine period in winter be taken advantage of and foliage bait applied, particularly to Citrus and Loquat trees.

From the 2nd of May when the test was inaugurated to its termination on the 23rd November, no less than 8,200 fruit flies were captured. The capture recorded is greater than last year over a similar period. In the test four traps have been used, and pollard and borax have been the lure. Tests of other lures were also made, but are not included.

The types of traps used were two petrol tins cut down to quarter size, with a marginal edge of one inch turned in all round. The other two were 10oz. lever or slip lid tins. It was found that the wider-mouthed tins gave the better results. In the use of any trap it is essential to see that the tin used is not too deep, as the flies will not enter a dark vessel. Provided, however, the trap is shallow and has a marginal edge, it may be of any width. The cut-down petrol tin is a good useful size, and owing to evaporation or flooding it is not advisable to use any larger. It was also found by increasing the amount of powdered borax that the lure would keep attractive longer.

It is now recommended, therefore, that the following mixture be used:—Pollard 8 ounces, powdered borax 8 ounces, water 1 gallon. Mix together thoroughly and steep for several hours. Shake well together again, allow to settle, and use the clear amber liquid, discarding the residue.

By using only the clear liquid the traps are not clogged, and are rendered much easier to clean. Renew lure once every week in hot dry weather and every 10 days in winter.

When cleaning out the traps every precaution must be taken to see that no flies are alive when the contents are thrown out. Any such flies would revive if thrown on to the ground. To obviate this danger empty the tins into a bucket having a little kerosene in it. The oil will float on the surface of any liquid put into the bucket, and thus living flies will be destroyed.

In the following table is given the total capture in the four traps for each month of the test, together with the percentage of males to females:—

Month.	Males.	Females.	Total.	Percentage of Males.	Percentage of Females.
1926.					
May	896	2,900	3,790	23·64	76·36
June	237	2,679	2,915	8·13	91·87
July	34	985	1,119	3·04	96·96
August	2	296	298	·67	99·3
September	...	75	75	...	100·0
October	...	2	2	...	100·0
November	...	...	...	...	...

Grand Total—8,200.

A perusal of this table will disclose a very important fact, namely, the obvious falling away of males captured as the winter advances. After mid July no males were captured. This then goes to prove my oft repeated statement, that the Fruit Fly in Western Australia depends in the main for its carry over, from autumn to early summer, upon pregnant females, derived from pupae in late May or early June, before the ground becomes too wet and cold, and which have survived the winter.

These flies shelter in the thick foliage of the citrus trees, where they are protected from the weather. They feed upon honey-dew, moisture, waxy coatings of citrus fruits, juice of split or bruised fruit.

If weather conditions are favourable to egg laying, a few Citrus fruits or Loquats may be struck and a winter generation of maggots produced. By this means another slender thread of carry over is formed. These maggots are slow in development, and if they reach maturity and pupate in suitable surroundings, will issue as early summer flies. Their numbers are few, however, especially in wet country.

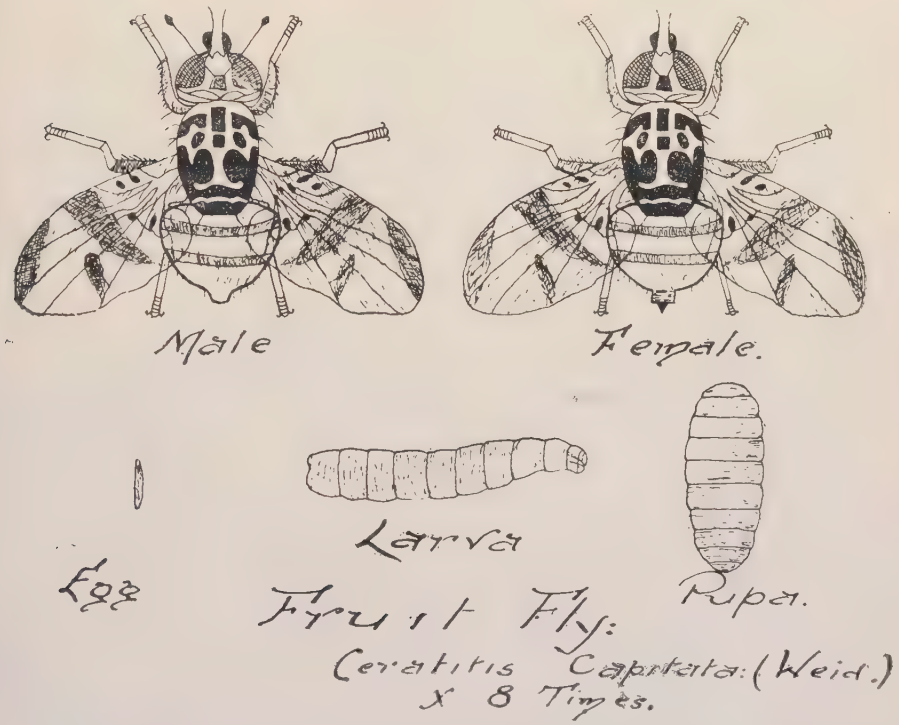
In the main, as before stated, the carry over is due to the overwintering females. The results shown herein demonstrate the value of winter trapping. It will be noted that the captures became less and less until in October we were down to two, and for the three weeks recorded in November no flies were captured. It would appear that the flies had gradually been weeded out, until none were left.

If all concerned would carry on this winter campaign of trapping, I am perfectly certain much effective work would be done. Every fly captured during this period is worth a thousand or more trapped in the summer and autumn, when they are in millions.

There appears to be a prevailing idea that as a result of the exceptionally wet winter, the fly will not be troublesome this fruit season. This is a dangerous presumption. No risks can be taken with this virile pest. If the number of flies captured in this test is any criterion, then we should bestir ourselves. The conditions, however, which govern the prevalence or otherwise of this pest are the favourable food supply and climatic conditions, which follow after September.

The prevalence or otherwise of parasites is not a factor, as unfortunately we have no effective natural enemies of this insect. I think it is, therefore, evident that great advantage will follow any co-operative effort to destroy these carry over flies.

It must, however, be distinctly understood that trapping does not take the place of foliage baiting, but is a worthy adjunct to same. It can also



be carried on successfully during that period of the year when foliage baiting is non effective. Foliage baiting from September to May is compulsory.

There is some confusion as to the terms Baiting and Trapping.

Baiting means the application to the foliage of the tree of an approved poison bait.

Trapping refers to the use of an approved lure, suspended in tins or traps.

HORTICULTURAL NOTES.

Geo. W. Wickens,
Superintendent of Horticulture.

SEASONAL WORK FOR JANUARY, FEBRUARY, AND MARCH.

January.

Fruit harvesting is the main occupation of fruitgrowers at this time of the year, and to a great extent the quality and quantity of the product will be governed by the thoroughness with which the routine work of the past winter and early spring has been performed. Pruning, spraying, fertilising, ploughing, cultivating, hoeing, thinning of surplus fruits, must all have received due attention at the proper time if the resultant crop is to achieve that degree of perfection which should be the standard aimed at by every genuine orchardist. The time has gone when haphazard methods were good enough; competition is now keen, and there is a steady increase in the quantity produced with a corresponding accentuation of the marketing problem. But it is noticeable and notworthy that a glut of really prime fruit hardly ever occurs in this State, and when it does so happen, it lasts only for a very short period. Anyone, however, who visits the wholesale markets cannot fail to be impressed with the fact that at a great majority of the sales there is always too large a proportion of low grade stuff. This does not refer to very inferior fruit, which should not be cased up and offered for sale, but to second, third and fourth rate lines which, in many instances, could have been made into a first if the trees and soil had received the required treatment. However, if the attention needed has not been given and the fruit now ready for marketing is not of the quality it should, and could be, growers so situated may enhance its attractiveness by careful selection, grading and packing. If all the fruit in a case is as nearly as possible of one size and quality, much better prices will be obtained than where the best and worst, and large and small, are placed all together in what may be described as the "jumble pack."

Apart from harvesting operations, soil cultivation for conservation of moisture and pest control are the main duties now requiring attention.

The worst fruit pest in this State is Fruit Fly. Every precaution should be taken by all growers in the infested districts to keep the pest under control. All fallen fruit should be gathered up, not once or twice a week, but once in every 24 hours, and all fruits found to be infested should be boiled. If this is regularly done, and foliage baiting and trapping also systematically attended to, losses from this pest can be kept down to small proportions. If no precautions are taken the effect is disastrous, both to the grower concerned and also to his neighbours.

Growers are here reminded that Codlin Moth is present in the State, both at Narrogin and Collie, and the most careful watch should be kept by every apple and pear grower, both while the fruit is on the trees and when it is being gathered, so that the first appearance of the unwelcome visitor in any fresh district or orchard may be at once known, and steps taken for its eradication. While it is present in small numbers it can be got rid of. This has been proved many times in this State, but should it become widespread, eradication becomes increasingly difficult, and it is of vital importance that the Department should be at once notified of any fresh case of infestation.

Two other pests are worthy of mention in the notes for this month, but they form a more pleasant topic to write about than those quoted above. Those referred to are Woolly Aphis—an apple tree scourge—and Red Scale, one of the worst insects affecting citrus trees. Fortunately both of these are being held in subjection by introduced parasites, and while in scattered places here and there some artificial treatment in the way of sprays is still necessary—in the great majority of orchards the little friends of the growers are doing wonderfully good work in keeping the pests under control.

February.

Gathering and marketing of stone fruits will still be in full swing during this month, and early varieties of pears and apples will also claim attention. The very early pears, such as Citron des Carmes and Jargonelle, are allowed to ripen on the trees and are fit to gather in December and January, but these are poor in quality and are not recommended for commercial orchards. Practically all the best pears must be gathered before ripening, and allowed to mellow in storage before they attain the peak condition of flavour and texture. In a less degree this applies also to apples, but there are some good varieties of the latter fruit which are excellent for dessert purposes when freshly pulled from the trees; Gravenstein and Jonathan being two good examples. The ease with which the stem of the fruit separates from the spur to which it is attached is a good guide as to the fitness of the fruit for gathering.

Arrangements are being made at time of writing by the Fruit Shippers' Committee for shipping space sufficient to take a few thousand cases of Williams (Bartlett) pears to London in the early part of this month. A similar consignment forwarded last season turned out quite successful, and it is hoped the trade may be built up to larger proportions for the variety mentioned is more largely planted in this State than any other, and an outside payable market would be a great boon to growers.

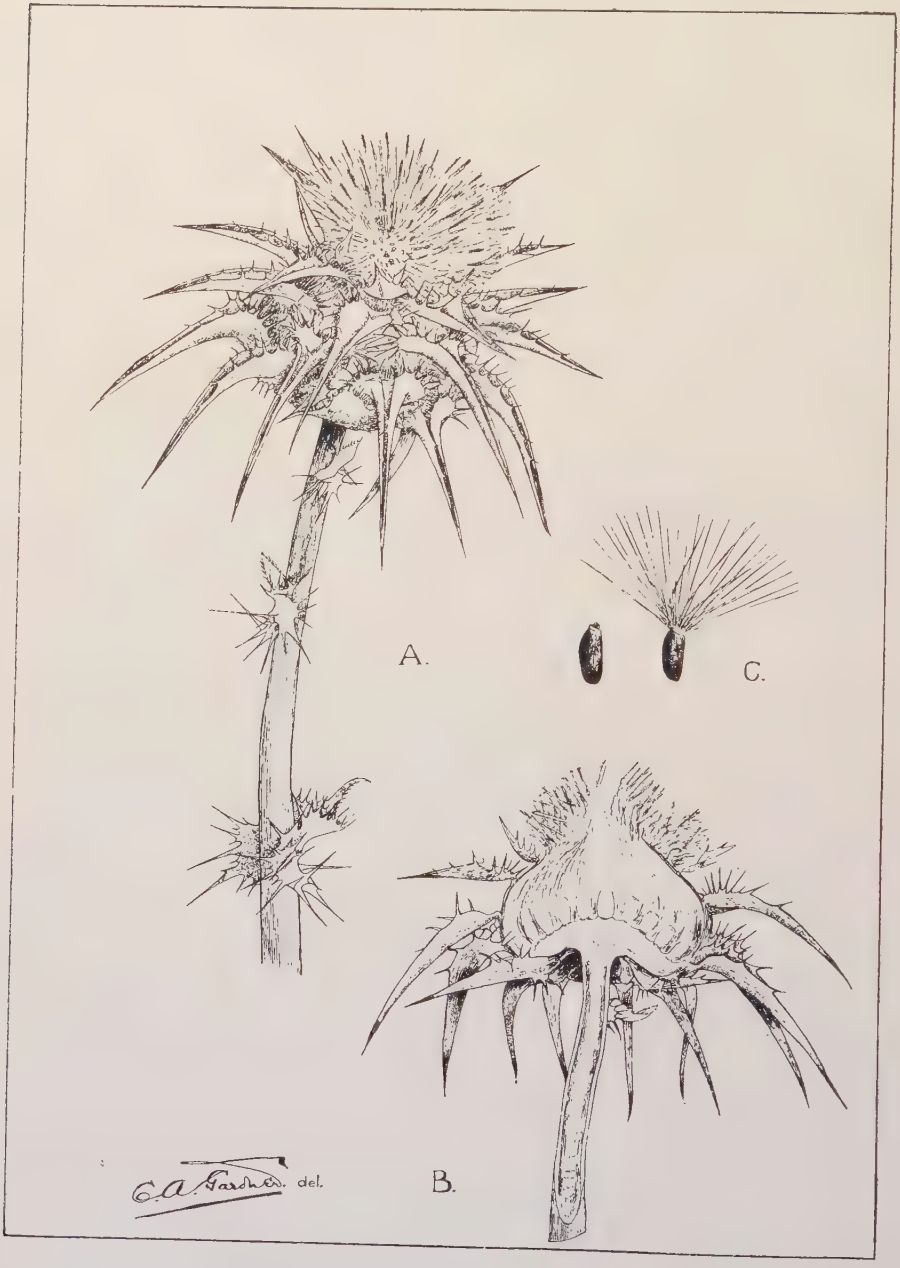
Cultivation and pest control still require careful attention.

March.

Picking and packing, both for local markets and export, is the order of the day during this month. In fact, March is the big month of the year for harvesting operations. These notes are being written in November, when it is too early to forecast the apple and pear crop, but present indications point to a good crop of pears and a bumper crop of apples. In the export season last year some growers forwarded fruit for export which showed infestation by San José Scale. The regulations prohibiting the export of any fruit so affected is still in existence, and growers must realise that if a consignment comes to hand at the port, and upon examination San José Scale is found to be present, even slightly, the whole of the consignment of the variety in question will be refused a permit to export.

Spraying in San José infested orchards received a lot of attention last winter, and there should be little difficulty this season in selecting only clean lines for export.

This is the month of the year, above all others, when Fruit Fly is most in evidence, needs most attention, and, because of pressure of other work, is often most neglected; but there is no work in the orchard which is so absolutely essential as the control of this pest, for if it gets beyond control the results of all other work are negatived.



Spotted Thistle (*Carduus Marianus*).

A. Flower head.
B. Section of flower head.
C. Seeds with and without pappus.

SPOTTED THISTLE.

(*Carduus Marianus*, Linn.)

W. M. Carne, F.L.S., and C. A. Gardner.

The Spotted Thistle is an annual or biennial plant occurring sporadically in various parts of the South-West and agricultural districts of Western Australia. Its large size, large undulate spotted leaves and handsome flower-heads render it a conspicuous species easily recognised among its congeners. Although spoken of locally as a Scotch Thistle it is quite distinct, the true Scotch Thistle (*Onopordon acanthium*) being quite a different plant with a neat flower head true in profile to the conventional design. Spotted Thistle is also known as a Milk Thistle, but this name should be reserved for *Sonchus*, described in the last issue of this Journal.

Originally a native of Europe, the Spotted Thistle has been introduced into most temperate countries. Its introduction into Western Australia is probably recent, but we find it recorded from around Melbourne prior to 1866. The name *Carduus* is an old Latin name applied to a thistle, *Marianus* being applied to the Virgin Mary.

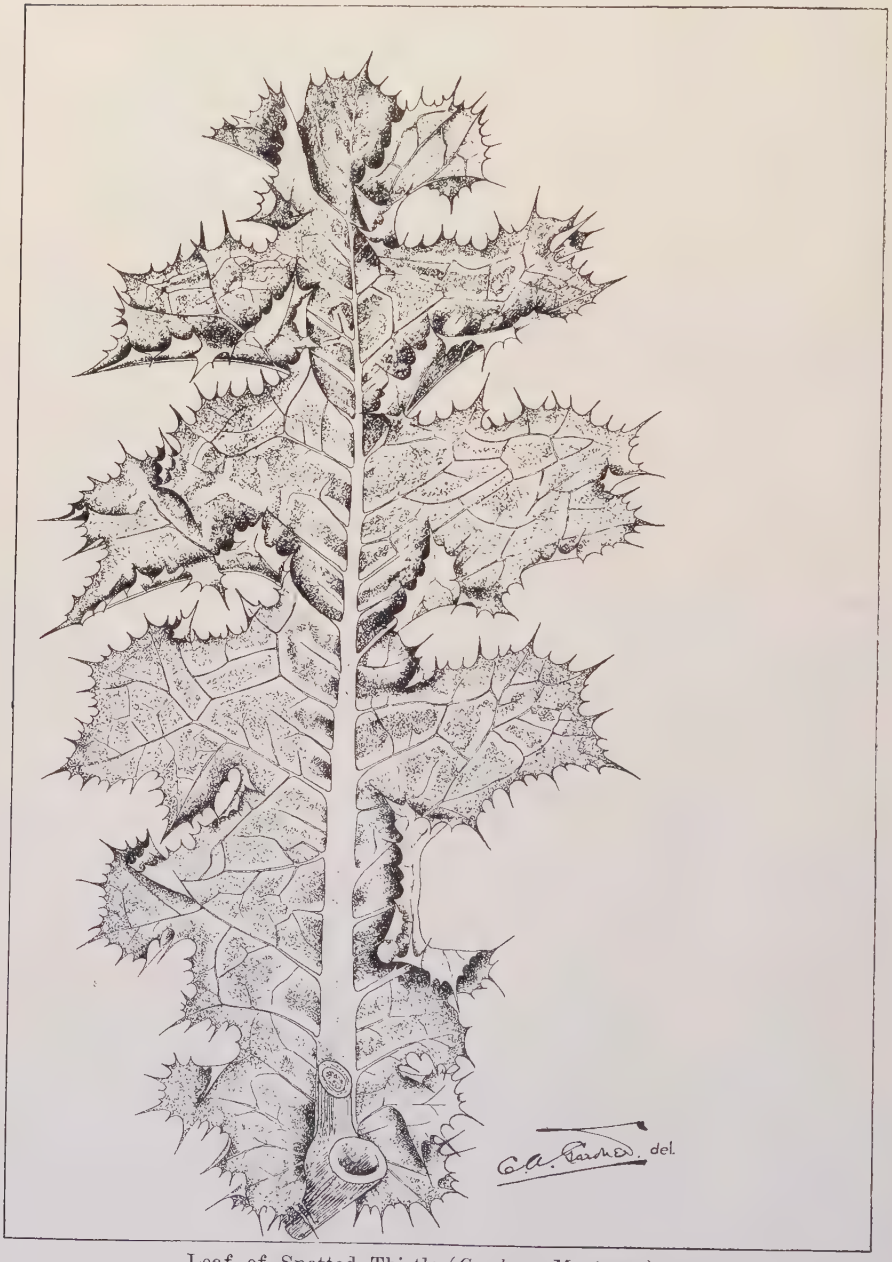
Within the last few years this plant has spread appreciably in the agricultural districts. We have had it recently recorded from between Bencubbin and Merredin, and also from near Yorkrakine, and it is said to be spreading in these places. The plant, being of rapid growth, may attain a height of six feet and almost as much in diameter in the space of six months. When young the Acanthus-like plants are succulent and liked by stock, hence feeding of by stock in this stage is likely to keep it under control to a large extent. If allowed to attain large proportions, however, the plants become very spiny and unapproachable so that nothing will eat them. In this condition it can only be regarded as a weed. The plants are particularly undesirable in fallowed land, since they rob the soil of moisture and impoverish it also.

Like the other thistles, Spotted Thistle seeds freely, and it is aided in this connection by wind. Animals may also play quite an important part in the distribution of seeds, particularly if they should chance to eat them. Although of some value when young this plant should be regarded as a weed, not serious at the present time, but one which may become so if unchecked. A disadvantage possessed by the plant is that it crowds out smaller plants, and when feed is becoming scarce attains its formidable proportions. Eradication should prove rather easy before the plants mature, as they do not grow very closely together, and they are easily cut down. Feeding off by stock is a simple preliminary to further eradicative measures.

Description of Plant.—An annual or biennial, three to six feet in height, and spreading to almost as much in diameter. Stem robust, streaked and angular, hollow, milky when young. Leaves up to two feet in length, undulate, dark green with whitish marking more or less following the secondary veins, prickly-toothed and hairless. Flower-heads large, erect when in the bud, and again when in fruit and drying, but when in flower more or less drooping or inclined to one side owing to the weight of the large involucre. Bracts large, almost leaf-like, rigid, toothed and very spiny, very spreading or somewhat recurved. Florets purple-violet. Fruit ellipsoid, blunt at the

apex, dark brown and smooth with slightly pale variegations. Pappus-bristles flattened and minutely serrulated (finely saw-toothed) or the outer ones plumose; all connected at the base and falling off as a whole soon after the fruit ripens.

For further particulars see the two plates.



Leaf of Spotted Thistle (*Carduus Marianus*).

POULTRY HOUSING.

W. T. RICHARDSON,
Poultry Adviser.

The question of suitable poultry houses has received little consideration or thought from our poultrymen in the past. The style generally adopted has been largely influenced by cheapness, or second-hand material, etc., with little regard for the comfort of the birds. Such structures have not been productive of full results in respect of health, egg production, general sanitation, etc. Thus we come across houses in competition with sky scrapers; others, of the portable type, on skids with abundance of undesirable ground draught and little or no overhead ventilation, such houses often becoming a fixture. Yet another and more general type is the low-roofed house presenting every disadvantage both to the birds and their attendants, with no visible benefits.

The last year or two has seen changes setting in with regard to poultry house construction. More up-to-date methods are slowly fighting their way through prejudice and conservatism, and the date is not far distant when improved housing methods will have to be adopted if the poultry industry in this State means to come into its own.

We have reached that stage when our production of eggs has about overtaken local requirements, and we must therefore look further afield for an outlet for our poultry farm products. This outlet already exists in the English market, which is prepared to take our eggs in unlimited quantities, if they are, amongst other conditions, clean (unwashed) and of wholesome quality. How can this be complied with if birds are kept in dirty, damp houses and yards. It must be borne in mind that the major part of our export takes place during the winter months when conditions on many farms are such that a good percentage of their eggs cannot be shipped because of their dirty state.

Proper housing of the laying hens, therefore, becomes imperative, and in this respect the semi-intensive shed has demonstrated its worth.

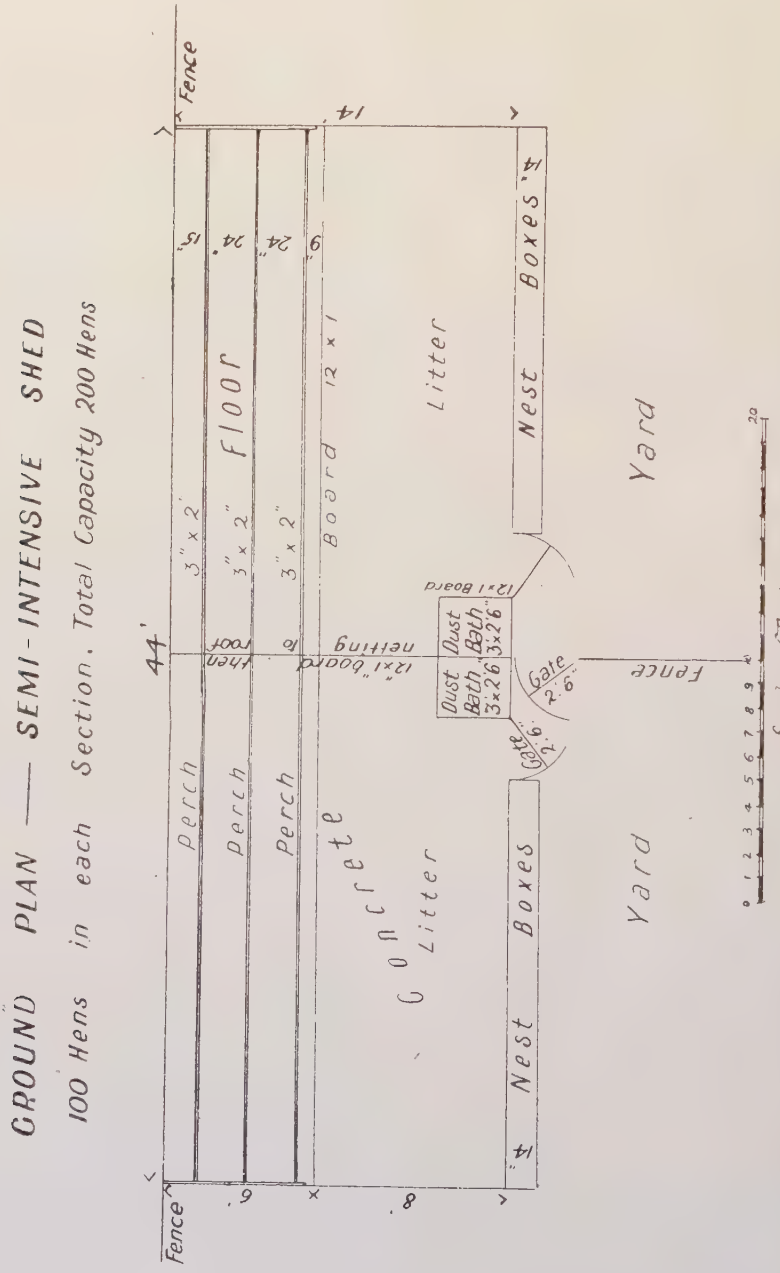
This is not a new idea or a new fad. Most of the countries, where poultry farming is conducted as a commercial proposition, have adopted the intensive or semi-intensive principle of housing their birds, irrespective of climatic conditions, with gratifying results.

The limited number of our breeders who have gone in lately for semi-intensive sheds speak well of the results obtained, *i.e.*, clean eggs and more eggs, especially in the winter, during sudden cold changes, and they are, or intend, extending in the same direction in the near future.

It is generally admitted that the active hen is the layer. Why then not get the utmost out of our flocks by making them be active and scratch for their living. This is the object of the semi-intensive sheds, the main features of which are that the hens are provided with a shed used partly as scratching quarters. The latter portion is supplied with deep litter into which the grain is scattered, thus affording exercise for the birds, under shelter.

The argument is often advanced that sandy soils provide all the exercise necessary to the birds as part of the grain feed becomes buried in the sand, and they have to scratch for it. This contention is correct to a limited degree. An unlimited amount of exercise is desirable, and it can only be

obtained in deep litter. In how much scratching do birds indulge during the winter months, when sandy soils are packed tight by the action of the rains, and the grain remains all the time on the surface of the sand? Stiffer soils offer the same disadvantage.

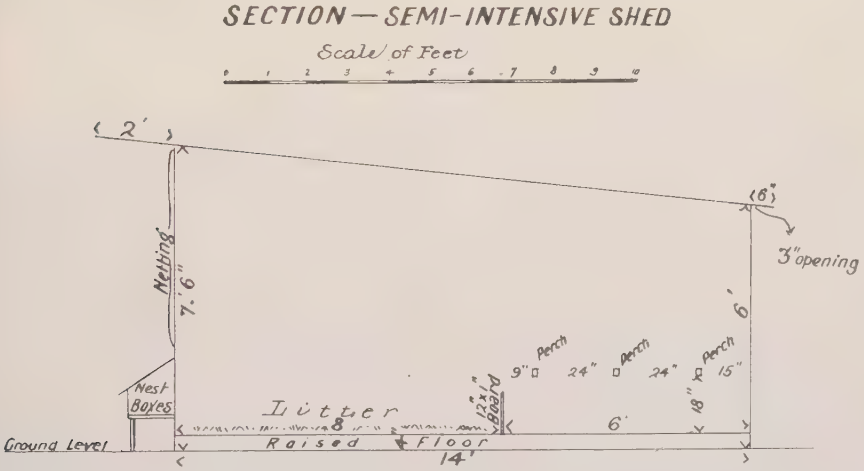


The above plan of a semi-intensive shed is based on the principle recommended by the Department of Agriculture, New South Wales, with some modifications in its details. This style of building is extensively in use in the Eastern States.

Floor Space.—Not less than three square feet floor space per bird—roosting and scratching combined—should be allowed. By multiplying the depth of the house (in feet) by the width and dividing by three, the carrying capacity of any semi-intensive shed can readily be ascertained.

Sheds.—The size of the shed should be determined by the number of birds it is intended to house. Semi-intensive sheds of 500 birds capacity and over are in use on some of the Eastern States Agricultural Colleges and Research Farms, and are giving very satisfactory results.

— *Fig. 2* —



The height of this shed should be six feet at the back and seven feet six inches to eight feet at the front according to the depth of the structure. Smaller sheds than that shown in Fig. 2 can be reduced to five feet at back and six feet at front. It is not advisable to go below this.

The top of the back wall should have an opening three to four inches wide along the whole length of the building for ventilation purposes. It will also help to reduce the temperature in the shed in summer by causing movement of air under the hot iron roof. The above opening is obtained by resting the rafters securely on the wall plate.

Extend the roof six to eight inches beyond the back wall to prevent any driving rain from penetrating into the house through above opening. Likewise extend the roof two feet beyond the front of the shed and the litter will be kept dry.

An even slope in the roof will give a greater amount of sunshine into the house, which should face the East, an important factor to the health of the birds. It will also give better and longer daylight up to roosting time.

The shed should have an open front, netted in, and a gate should be provided. Birds can then be closed in overnight if any are to be handled in any way on the following day, or they can be kept in during rough weather. The gate should come within 12 inches of the floor of the shed, and the intervening space boarded up to prevent the litter being scratched out of the shed.

Perches.—The roosting space required is arrived at by allowing seven and eight inches per bird for light and heavy breeds respectively. The perches should be made out of 3in. x 2in. hardwood, on the flat, with sharp edges rounded off, and 18 inches off the floor, the back perch about 15 inches from the back wall, and the distance between perches about 24 inches. This allows for free circulation of air between the rows of birds.

Where a number of birds are housed it is advisable to have the perches along the back of the shed, as shown in Fig. 1, instead of at one end, with the scratching portion taking up the rest of the shed. The reason for this is that the birds will be spread over a greater frontage with a reduced depth and a freer circulation of air will be obtained in consequence. Moreover, a better shelter will be afforded them along the back of the shed in the event of heavy easterly winds than if they were perching at one end of the shed through its full depth.

The perches should rest on movable boards placed at the end of each section of the shed, with supports midway or at convenient distances. None of these should be nailed down, the object being convenience for thorough treatment for vermin, etc. Removal of the droppings will in this manner be rendered much easier, as the perches can be pushed back against the wall during cleaning up operations, after which they are again spaced as already described.

If the back of the shed is against the side of a lane or passage way, one or more small trap doors, according to the size of the shed should be provided, through which the droppings may be swept into the lane, to be barrowed away when convenient. During spells of hot weather, the trap doors can be replaced by a netting frame.

A 12 x 1 board is placed on edge on the floor, along the whole length of the shed and about 9 inches in front of the perches, to prevent the litter from spreading under the latter.

Floor.—The floor of the shed should be at least 4 inches above the level of the ground, with a 1½ inch surface of concrete of the following strength:—

Four parts clean gravel or small stone.
Two parts clean sand.
One part cement.

Such floors have the following advantages:—

(a) Effectively control the Stickfast Flea.
(b) Raised floors ensure a dry floor.
(c) Dry floors and litter will keep the birds' feet dry and clean, likewise the eggs.
(d) Damp litter packs tight, and is not conducive to scratching.
(e) Damp litter gives rise to mould growth, and may cause aspergillosis.
(f) All the manure deposited on them can be easily removed, and the floor effectively disinfected whenever necessary.
(g) They are moderate in cost, and last forever.

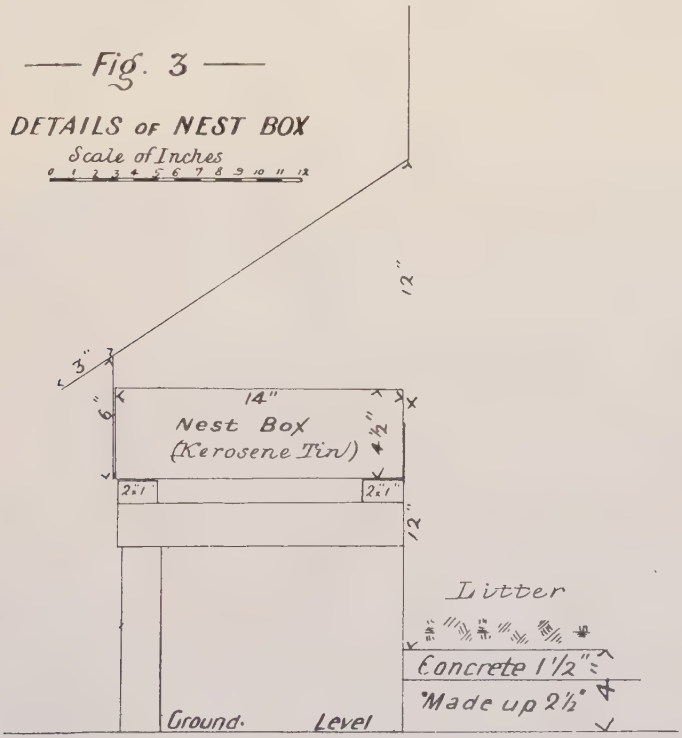
Litter.—The litter, or scratching material, should consist of chaff, straw, grass or horse manure, etc., and must always be in a dry condition. Dry leaves are not suitable, because by constant scratching they break up into dust, to the inconvenience of the birds.

Start with litter about one inch deep, and gradually increase up to 6 or 8 inches, and renew the litter every three or four months.

Feed all grain in the litter, about 2 hours before sundown, which will give the birds ample time to scratch for and find their food, and go to roost with full crops.

Dust Baths.—3ft. x 2ft. 6in., are provided for each section, to be increased according to the size of the shed.

Nest Boxes are placed at the front of the shed, and are accessible from the inside. The nests themselves are made out of kerosene tins cut in two, on the flat, with edges hammered back, placed alongside one another, each

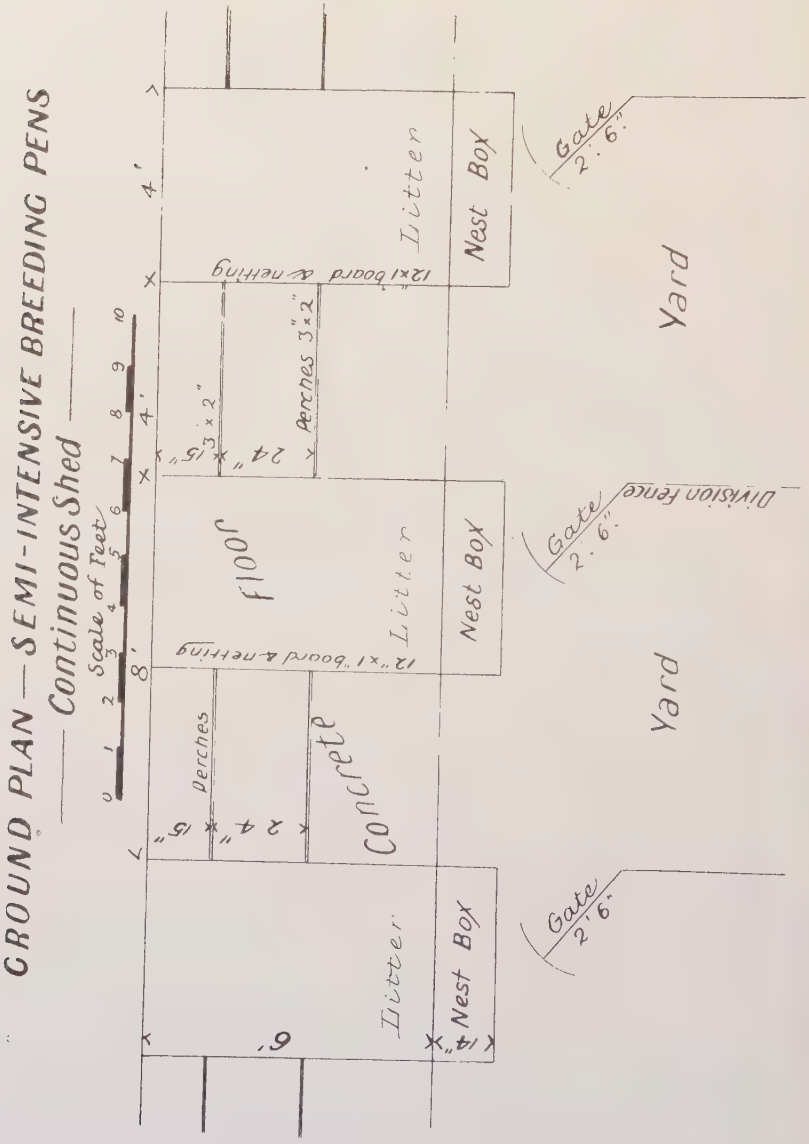


end resting on 2in. x 1in. boards running the whole length of the nest boxes, and supported by wooden brackets or cross-supports and legs, and housed in, as shown in detail in Fig. 3.

It is not essential to have the sloping roof over the nest boxes in sections and on hinges. The sheds have to be entered when scattering the grain in the litter and this operation performed, the eggs can then be gathered from the inside of the house. Shell grit in the boxes makes very satisfactory nesting material. It does not harbour vermin, and is always available to the birds.

Water.—Provision can be made for water by a tap and receptacle being placed in the shed.

Yards.—In sandy soils allow not less than 40 square feet yard space per bird, to be increased to 60 square feet according to the nature of the soil.

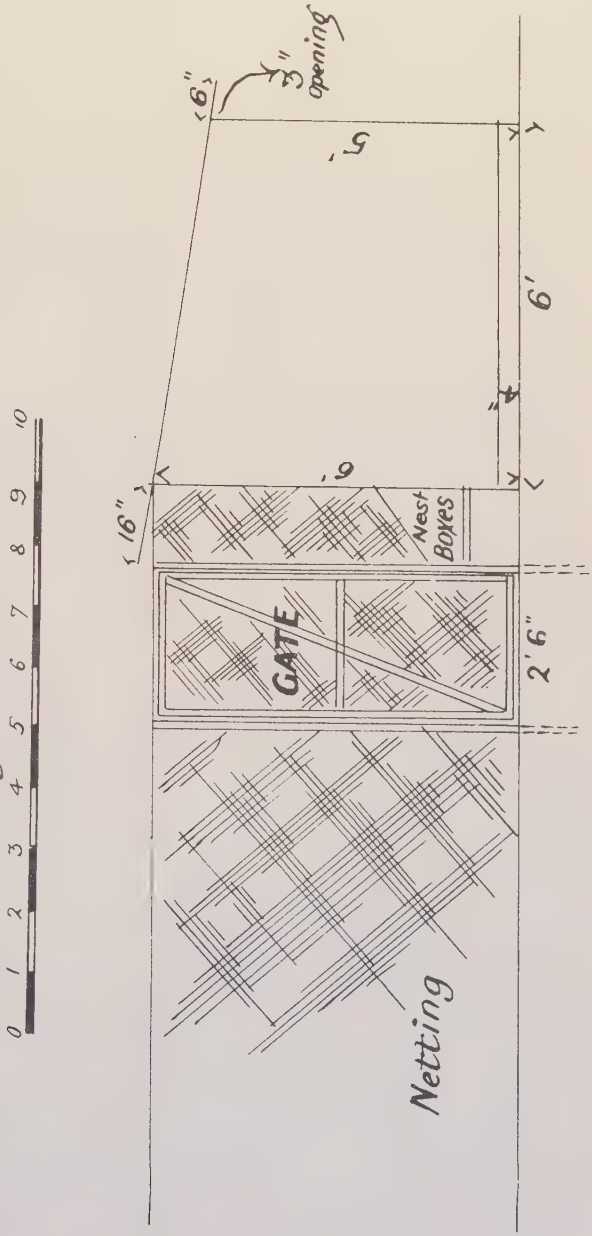


The semi-intensive principle should also be put into practice with regard to housing the breeding birds. Exercise, abundance of it, is an adjunct to the production of good hatches and strong livable chickens. Figs. 4 and 5 show a useful style of breeding pens.

The principle it is desired to impress on poultry farmers is—exercise for the layers in comfortable, well-ventilated, dry and sanitary houses, details of which can be made to suit the fancy of each individual farmer.

Fig 5

SECTION— SEMI-INTENSIVE BREEDING PENS & YARDS



Figures 6, 7, 8, 9, 10 and 11 are intended to illustrate some of the semi-intensive houses in use on some farms.

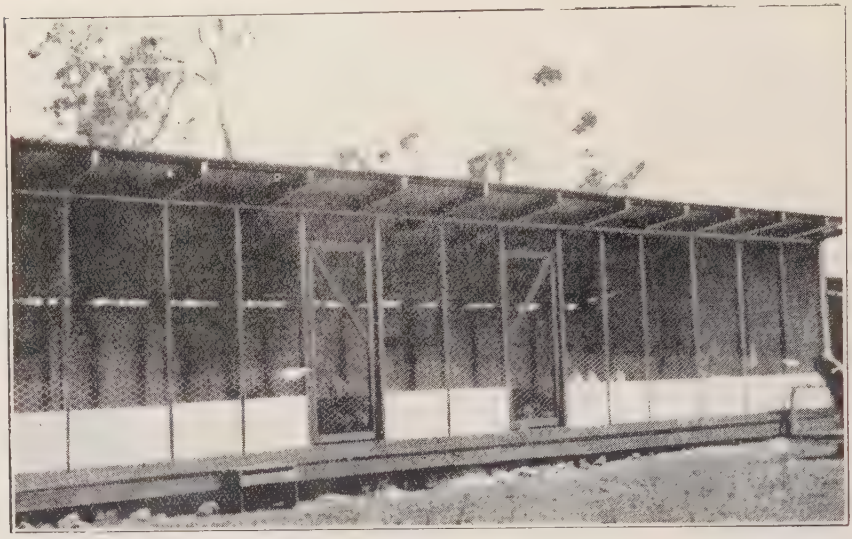


Fig. 6.—Semi-intensive sheds on Mr. H. J. Morrell's poultry farm at Walliston, near Kalamunda, from plans supplied by the Department of Agriculture, details of which are given in Figs. 1 and 2. Size 44ft. x 14ft., 6ft. high at back and 7ft. 6in. at front. Divided by wire netting into two sections 22ft. x 14ft., each to carry 100 laying hens. The roof is of G.C. iron and the back, ends, and part of the front of fibrolite. The floor is of concrete. Approximate cost of material £35, or 3s. 6d. per bird housed.

The nest boxes have been placed inside the shed, against the partly covered-in front and on a stand 12 inches high. The yards are now in course of erection.

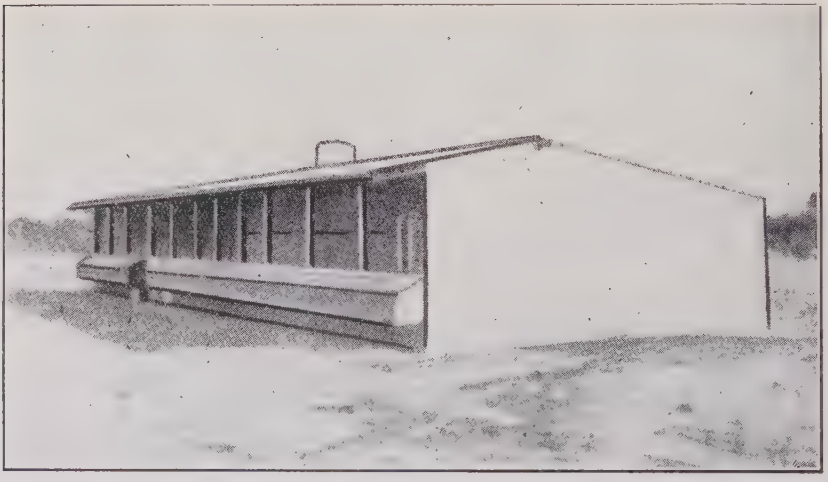


Fig. 7.—Semi-intensive shed on Mr. F. L. Brocklehurst's poultry farm, Armadale. Size of shed 50ft. x 14ft.: will house 230 birds. Height at back 5ft., at ridge 7ft., at front 5ft. 9in., eave 2ft. The nest boxes are to be seen in front of the shed and are accessible to the birds from the inside of the shed.

Approximate cost of material, 3s. per bird.

Concrete floors have not been put down.

Fig. 8.—Semi-intensive shed on Mr. M. Love's poultry farm, North Lake Road, Melville. Size of shed 60ft. x 16ft.: capacity 320 birds. It is intended to wire-net the front in the near future. The nest boxes are on a raised platform in the centre of the scratching portion of the building.

Approximate cost of material, 2s. 9d. per bird. Concrete floors will be provided for shortly.

Mr. Love has six similar sheds on his farm, each standing on one acre of ground.

Fig. 9.—Semi-intensive sheds on "Kalgurli" poultry farm, Belmont, built with cement bricks made on the premises. Particulars as to size, cost, etc., will be given in a later issue.

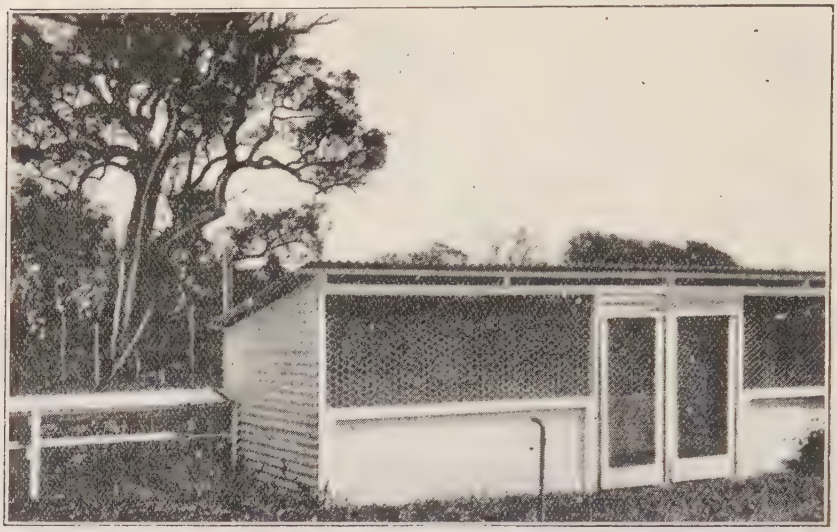


Fig. 10.—Semi-intensive shed on Mr. R. A. Dusting's farm, North Beach Road, Osborne Park. Dimensions 24ft. x 6ft.; 5ft. high at back and 6ft. at front: capacity 48 to 50 hens. The nest boxes are to be seen on the left and outside of this shed, on a raised platform with iron roof.

The yards are at the back of the house, and access to them is through trap doors at the back of the shed.

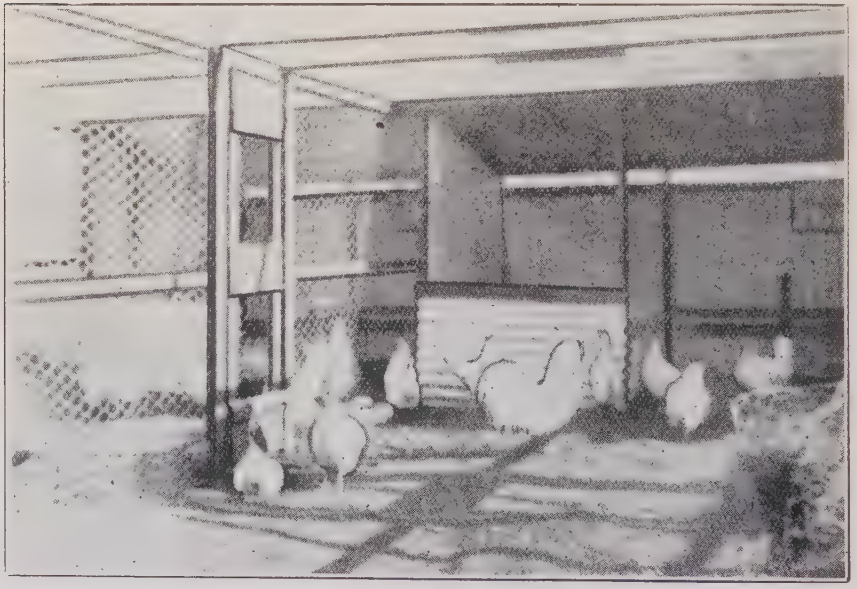


Fig. 11.—Four semi-intensive breeding sheds, continuous house, on Mesdames Walker & Co.'s mixed farm, "Juadine," Spencer's Brook, built from plans, etc., supplied by the Department of Agriculture. See Figs. 4 and 5. In these sheds the nest boxes have been placed against the side of the division walls, as shown in the photograph.

The opening along the top of back wall is for ventilation purposes. The netting basket on the right of the picture is full of green lucerne, which is changed or replenished several times during the day and is therefore always available to the birds.

All the birds on this farm, about 500 head, are housed in semi-intensive sheds on the principle of Figs. 4 and 5.

CODLIN MOTH.

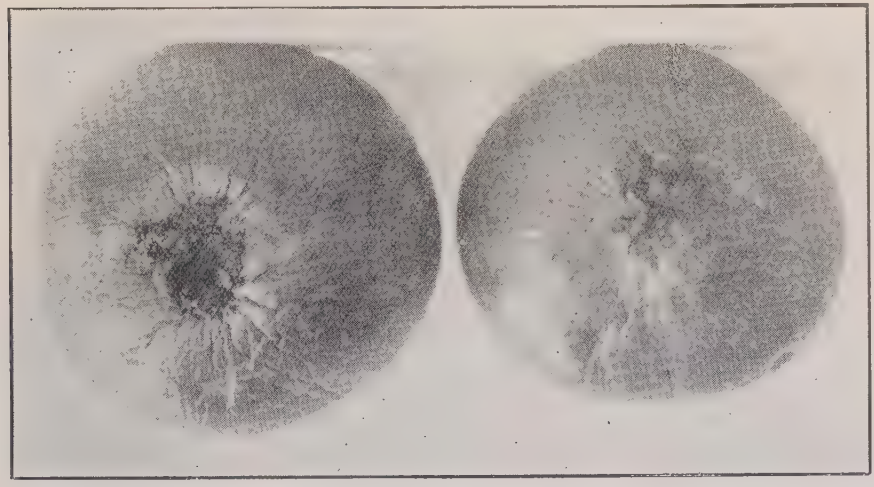
(*Carpocapsa pomonella.*)

L. J. Newman, F.E.S.,
Entomologist.

Originally a native of Europe, this serious pome fruit pest has spread throughout almost all countries producing apples and pears.

Wherever it has become established, it annually destroys a large percentage of fruit. It is a pest of long standing, being recorded in Europe as far back as 1635.

It was scientifically named by Linnaeus in 1758. In 1817 the pest had reached America. In 1857 it was discovered in Tasmania. There is little doubt that the insect reached the mainland from Tasmania. In 1885 it was recorded as present in both Victoria and South Australia. Two years later (1887) New South Wales was invaded, and in 1889 the moth appeared in Queensland. The State of Western Australia remained free until the year 1903. Since this first appearance, which was completely subdued, we have had no less than eleven outbreaks, including the present one.



Apples showing castings of Codlin larvae.

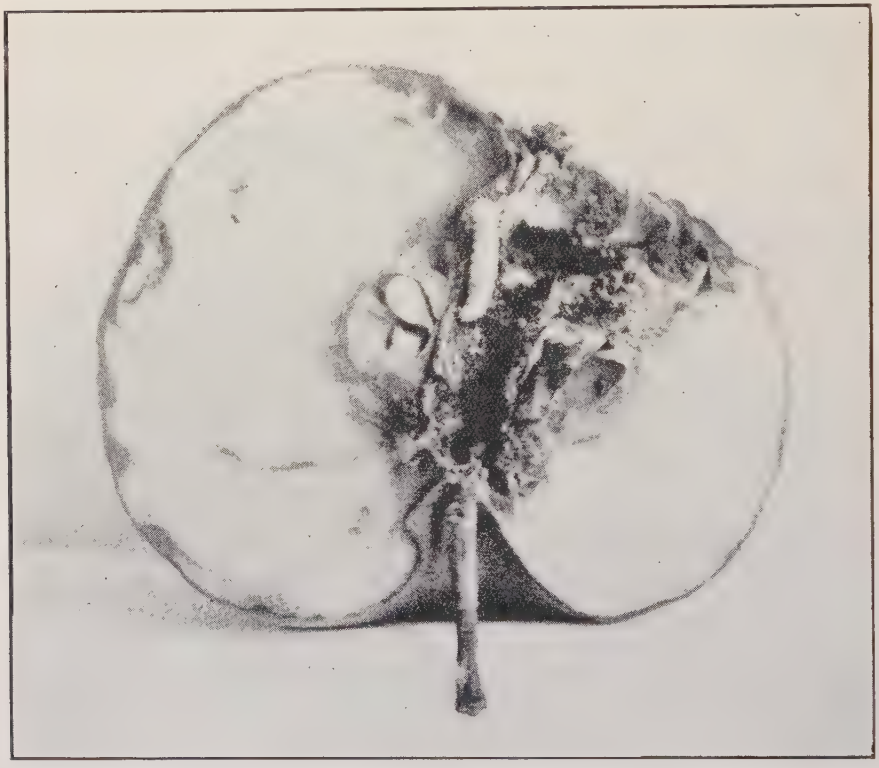
The present recurrence is no doubt the most serious that we have ever had to deal with. The fact that ten previous outbreaks have been successfully combated, should stimulate all concerned to make a more determined effort than ever to rid our orchards and State again of this virile and destructive pest. The previous ten records of extermination have only been accomplished by the hearty co-operation of the growers and all concerned, with the Department of Agriculture.

There appears to be no reason why the same mutual help will not be forthcoming, and if such be the case, the battle is well on the way to victroy. To assist the Department it is desirous, in fact necessary, that all growers

of fruit keep a sharp lookout for the presence of any caterpillars suspected of being this pest, and forward same to the Entomologist for identification.

Prompt determination, followed by immediate remedial measures, is essential if we wish to prevent a wide spread of the moth. Once allowed to obtain a strong footing we shall never be able to wipe it out. If its presence in an orchard is deliberately or in ignorance kept a secret, it will sooner or later burst bounds, and it will then be a case of "The biter bitten."

It is a good policy to keep in touch with the Department, and have any insect of which you are suspicuous, identified. The Department is out to help and not to hurt.



Cut apple showing typical work of caterpillar. Note pips have been consumed. (Original.)

The absence of this undesirable insect from our State is, and has been, a matter of extreme importance.

Any fruit grower, who has had previous experience in keeping this insect in check, readily realises how well off apple and pear growers are in Western Australia, when compared with the great loss and expense incurred in the Eastern States of Australia and other parts of the World, where Codlin Moth is established.

Should it become a permanency, not only will large quantities of fruit be annually rendered unfit for market or sale, but growers will be put to the

time and expense of spraying at least four time during every fruit season with arsenate of lead.

In the sale of our fruit, the non-existence of the Codlin Caterpillar, gives the local fruit a great advantage over other countries where the moth exists, in that we can guarantee our fruit free. There is also another important factor, and that is the absence of any need to use arsenical sprays on our fruits during the period when same is ripening.

To enable growers and others to recognise the presence of this caterpillar, the following points are given:—

1. A collection of castings more or less held together by webbing in the calyx or flower end of the fruit which, when removed, reveals a tunnel descending into the core.

2. The fruit, when the grub has established itself well within, generally exudes a brown gummy substance from the mouth of the entrance tunnel. The escape hole seldom exudes this gummy matter, the larva pushing it back

Apples showing typical markings made by young caterpillars in nibbling around before entering the pip cavity.

into the cavity. The presence of this substance is almost infallible evidence that the larva is within.

3. Affected fruits usually turn yellow in the eye, or other point of attack, and fall prematurely.

4. The exit hole of the escaped caterpillar.

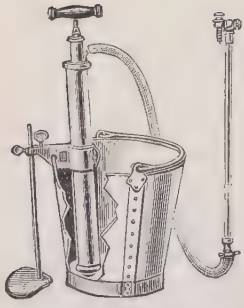
5. The larva or caterpillar of the Codlin Moth has six legs attached to the first three segments behind the head, and 10 false legs or sucker feet attached to the 6th, 7th, 8th, 9th and posterior segments of the body. When

fully grown the larva is about one-eighth inch in body thickness, slightly under three-quarter inch long, flesh coloured, and having a few stiff hairs scattered over its body.

During a careful inspection being made in the orchards, Inspector Fears discovered a number of apples showing the typical nibblings made on the surface of the young apple skin, by the codlin caterpillars. These marks indicate the way in which these newly hatched larvae feed, before burrowing into the apple.

It is obvious, therefore, that if the fruits are well coated with a protective covering of arsenate of lead, these caterpillars are poisoned and killed before they can enter the fruits. (See block on previous page.)

For a full account of the life history of the Codlin Moth and remedial measures, apply to the Department of Agriculture for Bulletin No. 30.



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4—4

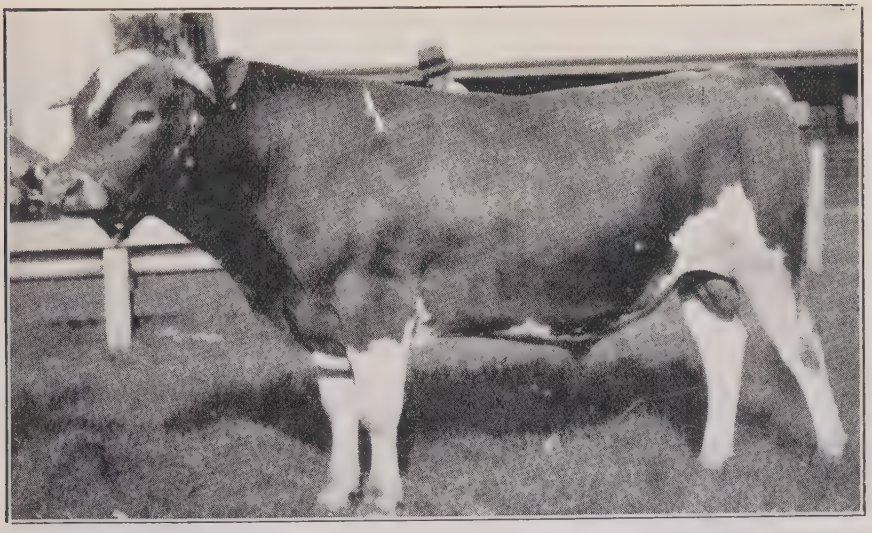
DAIRY CATTLE IMPROVEMENT.

HOW THE WEST AUSTRALIAN DAIRY FARMER IS DEALING WITH THE "SCRUB BULL" PROBLEM.

P. G. Hampshire,

Superintendent of Dairying.

The West Australian dairy farmer can claim, with considerable feeling of pride, to have tackled the "scrub bull" menace with great success. A review of the operations of "The Dairy Cattle Improvement Act, 1922," to date discloses the satisfactory manner in which this Act is operating in the improvement in the class of dairy sire in use in Western Australia. This Act came into operation about the middle of 1923, but, owing to the difficulty of the Act becoming generally known during that year, and the small number of registrations that were recorded, the Hon. Minister allowed the registrations for 1923 to be carried over to 1924, so that actually the Act did not come into force, with any great degree of observance, until that year



"Triumph of Wollongbar."

A Western Australian Dairy Herd Improver, the progeny of a pure proved production cow.

Since the inception of the Act, and up to the end of November, 1926, the total registrations recorded are 1,547. A dissection of the registrations to date discloses the following information:—

In 1924 the total number of pure bred bulls registered was 177. Of these pure bred bulls, 77 were the progeny of officially tested cows with production above standard.

At November, 1926, the number of pure bred bulls registered was as follows:—

Jersey—269.
Milking Shorthorn—175.
Guernsey—103.
Ayrshire—36.
Holstein-Friesian—24.
Red Poll—8.
Dexter and Dexter-Kerry—7.

Total—622.

Of these pure bred bulls, 308 are the progeny of officially tested dams with production above standard. Herein will be seen a marked improvement in the calibre of the bulls registered in 1926, especially as the pure bred bulls represent 50 per cent. of the total number of bulls registered, and of the pure bred bulls registered, 49 per cent are the progeny of proved production cows. In other words again, 25 per cent. of the bulls registered in Western Australia are not only pure bred, but are the progeny of cows that have been officially tested, and have proved to be above standard producers. This may surely be claimed a remarkable achievement.

"Calamity II. Dairyein."
A Dairy Herd Destroyer: One of the 325 "Scrubs" that have been eliminated.

The development policy under the Group Settlement Scheme in Western Australia may be attributed in a large measure to the marked improvement in the calibre of the pure bred bull in use, as it is the policy of the Government, in regard to group settlers and Agricultural Bank clients, to supply registered pure bulls ex tested dams, and to date 242 bulls of this quality have been distributed.

Probably what is one of the most gratifying features of the movement towards herd improvement in Western Australia by the operation of this Act is the fact that, since its inception, 325 bulls have been eliminated, due to their being unsatisfactory and of the "scrub" type. This represents 21 per cent. of the total bulls registered; in other words, one bull to every five which were originally submitted for registration has been eliminated.

One of the principal features in the operation of the Dairy Cattle Improvement Act is the simplicity of the Act and its regulations. The Act is a short one of 15 clauses, and the regulations number eight. The principal clauses of the Act are Nos. 5, 6, and 11, and read as follows:—

5. (1.) Registration under this Act is hereby required for every bull kept within an area defined under section two.

(2.) If, after the commencement of this Act, any unregistered bull over the age of nine months is kept within an area defined under section two of this Act, the owner of such bull shall be guilty of an offence.

Penalty: Twenty pounds.

6. (1.) Registration shall be effected annually in the prescribed manner, at the Department of Agriculture in Perth, on payment of a fee of five shillings; and a certificate of registration in the prescribed form shall be issued to the owner of the bull.

11. (1.) After the expirartion of two years from the commencement of this Act registration may be refused if the bull is below a reasonable standard to be prescribed:

Provided that, if on application to the Department of Agriculture registration is refused, the owner may, within the time and in manner prescribed, appeal from such refusal to an appeal board consisting of the Dairy Expert of the Department and two other members, being cattle breeders, to be appointed by the Minister.

(2.) The appeal board may allow or dismiss the appeal, and the decision of the board shall be final.

These clauses may be taken as "the backbone" of the Act. Clause 11 provides the great value of this Act in the elimination of the undesirable dairy sire, as it enables the Hon. Minister from time to time to prescribe a standard which bulls must reach before being registered. As will be seen, provision is also made for an appeal board to adjudicate in cases where owners object to the refusal of registration of their bulls. Two well known studmasters, Messrs. T. H. Wilding, of Mokine, and R. H. Rose, of "Grass Vale," Burekup, have accepted their appointment by the Hon. Minister for Agriculture to the board of appeal.

With the initiation of this Act, it was recognised that it would be quite impossible to set down any standard as to the type of bull which should be used with the assumption that such a standard would be fixed for time immemorial. Again, it was recognised that to make a standard high at the outset would place an undue hardship on cattle breeders in regard to their securing dairy sires of a standard that would be necessary to make any forward move. In the circumstances, the elasticity of the clause which permits of the creation of standards from time to time allows a gradual "tighten-

Dairy Cattle Improvement.
The result of using a good herd sire.

ing up" in the type of bull that will be registered. As will be seen, Clause 11 permitted the registration of any bull for two years from the commencement of the Act, thus allowing owners an opportunity to put their house in order.

A copy of the regulations will be of interest:—

1. The prescribed area for the operation of the Act shall be the South-West Division of Western Australia.

2. An application for the annual registration of a bull shall be in the Form No. 1 in the schedule to these regulations. The registration fee of 5s. must be paid with the application.

3. A certificate of registration of a bull shall be in the Form No. 2 in the schedule.

4. An application for indorsement of transfer or a certificate of registration may be made in the Form No. 3 in the schedule.

5. It shall not be obligatory to register a bull kept on any station solely for the breeding of beef cattle, if the owner obtains from the Director of Agriculture a certificate in writing exempting such bull from the Act.

6. Registration shall be refused unless the bull be well grown according to age, sound in constitution, and manifestly showing evidence of the breed characteristics of one of the following dairy herds:—Ayrshire, Dexter-Kerry, Guernsey, Holstein, Friesian, Illawarra Milking Shorthorn, Jersey, Kerry, Milking Shorthorn, Red Poll.

7. Appeals against refusals of registration shall be lodged within 14 days of the service upon the applicant of notice of refusal to register.

8. Notice of appeal shall be given on Form 4 (as prescribed by these regulations), and shall be accompanied by a fee of £1.

The first attempt to "tighten up" was in January, 1925, when Regulation 6, shown above, was agreed to, whereby registration would be refused unless a bull were well grown according to age, sound in constitution, and manifestly showing evidence of the breed characteristics of one of the above-mentioned dairy breeds.

The form of application in connection with the registration of bulls provides excellent propaganda in bringing under the notice of some of the owners of bulls the deficiencies of the animals they own, and probably this application form has done more than any other means in pointing out to owners the manner in which their bulls fail, and has induced dairymen when securing their next dairy sire to look for one which has some qualifications for the purpose for which he is intended. From a perusal of the application form hereunder, it will be noted that, in filling in this form in the case of the registration of many of the bulls, a considerable number of blank spaces will have to be left; whereas the owner of a bull which is of such a character as enables him to fill in the information desired does so with a considerable feeling of pleasure and pride.

Application for Registration of Bull for the year ending 31*st December,* 192 .

Name of Applicant.....

Address .....

Whether Applicant is Owner, Lessee, or in possession.....

Name and Address of Owner of Bull.....

Age of Bull at date of Application.....

Breed of Bull.....

Name of Bull and Herd Book No. (if any).....

Sire—

Name and Herd Book No. (if any).....

Official production of Sire's dam (if any).....

Dam—

Name and Herd Book No. (if any).....

Official production .....

Colour and distinguishing features or markings.....

Brand.....

It should be pointed out that it is not always the mongrel bull that is the scrub bull, as it is not infrequent to come across pure bred scrubs. By this it is meant animals which, whilst probably of pure parentage, have been so neglected, ill kept, and ill fed, and are of such poor dairy type and weak constitution as to be very undesirable.

I have pointed out, in regard to pure bred cows, that "purity without production is like a bucket without any milk." The same thing applies in regard to pure bred bulls unless the animal's ancestors are proved producers.

Dairymen throughout the State are behind the Dairy Cattle Improvement Act, as is evidenced from the letters received from all parts of the State, and the support this Act obtains from farmers' conferences. Up to the present, it has been possible to obtain the registration of the bulls in the State without resorting to prosecution, with the exception of one instance. Whilst we do not suppose that every bull in the South-West Division of the State has been registered, the indications from the number of animals

submitted are that the great majority at least have been recorded. We do know, too, that in the recognised dairying districts inspectors under the Act have carefully combed the districts with a view of obtaining the registration of all bulls under the Act. No doubt there are still unregistered animals at large, but every endeavour is being made to locate them.

The Registration of Bulls.

It is the intention of the Department of Agriculture to enforce strictly the Dairy Cattle Improvement Act, and the following information, therefore, may be of benefit to owners.

1. It is provided that *all bulls over the age of nine months* (with the exception of pedigreed beef strains kept solely for beef production, which can be exempted on application, when the Director is satisfied that they are purely beef cattle), *must be registered annually on or before the* 21*st January.*

2. The fee payable is 5s. *per annum* for each animal, and should be forwarded with the application for registration.

3. *Failure to register annually* constitutes an offence against the Act, rendering the offender liable to a *penalty of* £20.

4. It is necessary for owners to notify the Department, quoting the disc number, immediately any registered bull is—

(a) *transferred* (in which case the name and address of the new owner must be furnished);

(b) *sold for slaughter, castrated, or deceased* (in order that the registration may be cancelled).

5. No disc can be transferred to an animal other than that for which it is issued, and once registered a bull retains the same disc number even though he may change owners. The disc should be attached to the left ear, and, in the event of sale, should be passed on to the purchaser together with the certificate of registration.

6. The registration holds good for the year in which it is effected only, and dates from the 1*st January to the* 31*st December,* irrespective of when the certificate is issued (thus a registration effected in September would only hold good until the 31st December, and then be due for renewal).

7. In the event of application forms not being available, the particulars may be submitted by letter, but full details of breeding, age, etc., must be furnished.

8. When registering for the first time, it is necessary for the applicant to supply, if possible, the name of the previous owner (if any) and the breeder.

9. The number of the disc issued should always be quoted on applications for re-registration.

By observing the foregoing, owners will greatly facilitate the administration of the Act.

FULGHUM OATS.

I. Thomas,
Superintendent Wheat Farms.

Fulghum Oats (P. 1465) was first planted at the Merredin Experiment Farm in 1922, when it was received from Cowra, New South Wales. Its planting in the hand-planted test rows was continued each year since that date until 1925, in order that observations regarding its character might be made; during that period it appeared of great promise for the conditions in this State, because of its apparent ability to yield well, and to produce a good plump grain. It was, therefore, decided to test it under field conditions, and accordingly in 1925 it was planted in the Oat Variety Trial, where it could be compared with the variety "Burt's Early" as a control. The results obtained in that year under field conditions confirmed the opinion previously formed as the result of growing it in the smaller plots. A further trial was made during the present season, and the variety maintained its good reputation almost right up to the matured stage. Just before maturity, however, unfavourable weather conditions, including strong winds, were experienced. This variety then became badly "laid," and to such an extent as to present the appearance of having had a roller passed over it. The extent to which it was affected may be seen from the illustration herewith.

Other varieties were more or less damaged by the wind, but not nearly to the same extent. It is obvious, therefore, that it has specially weak straw, and because of this it has been decided, despite other good qualities, that it is unsuitable for our conditions, and, therefore, to abandon the plan of raising seed, and distributing it for general cultivation.

BERSEEM, OR EGYPTIAN CLOVER.

(*Trifolium Alexandrinum*, Linn.)

W. M. Carne, F.L.S., and C. A. Gardner.

This plant must be regarded as one of our unimportant clovers, and is not extensively grown in Western Australia. To be grown on a large scale it usually requires irrigation, and under this treatment can be cut periodically. It is not suitable for grazing, and is not cut for hay in this State, but is used as a succulent green feed for dairy stock, being cut as required.

Description of Plant.—An erect annual or biennial plant of 10 to 18 inches in height, erectly branched and sparingly hairy. Stipules lanceolate-subulate; leaflets oblong to lanceolate, *i.e.*, narrow in comparison to width. Flower heads white, usually on fairly long stalks, but sometimes almost stalkless, egg-shaped in outline, becoming oblong-conical when in fruit. Calyx half as long as the creamy white corolla, the lobes acutely lanceolate, three-nerved at the base, spreading as the plant matures, of the same length as the bell-shaped tube, the lowest lobe slightly longer. For further details see accompanying plate.

Berseem Clover, when sown on a well-prepared and fertilised soil, makes a dense erect growth, and is relished by stock. It does not live for more than two years, and requires for its cultivation as much care as lucerne, hence the latter is more commonly grown here.

The plant requires heavy soil and warm conditions for successful germination, hence it should be planted in February or March. Since there is rarely sufficient moisture in the soil at this season of the year, irrigation under most conditions is necessary. If sowing is carried out later in the season the crop is likely to fail from lack of warmth. Spring sown crops are only successful in the Northern parts of the South-West agricultural districts. With early sown crops four or five cuts may be made between May and December. The first cutting should take place when the plants are 12 to 18 inches high. During the winter the growth is slow, but with the approach of warm weather the plants grow rapidly and flower. If allowed to seed the subsequent cutting will be lost. With irrigation or very moist conditions growth can be made until well into December, otherwise it ceases when the soil becomes dry.

Berseem Clover is more succulent than lucerne, and provides early winter feed, but it must be remembered that it is more difficult to successfully cultivate, the duration of life is short, and the plants are not so resistant to dry conditions.

Berseem or Egyptian Clover (*Trifolium Alexandrinum.*)

A. Flowering stem.
B. Leaf.
C. Flower head.
D. Flower.

CLEARING LIGHT LANDS AND SCRUB ROLLING.

Alex. I. Horan.

The problem of economically clearing light lands has been simplified to a great extent during recent years by a general use of the disc plough. An eight-horse team and Sundercut will plough almost anything through which they are able to walk, provided the taller scrub, liable to catch the couplings, be first removed. If the settler is so fortunate as to own a medium-sized tractor, and will take the precaution to protect the radiator from damage, the area of ground that can be ploughed over is almost incredible. Then, after a good raking in March or early April, using a heavy *scrub* rake with a rail bolted to the top of the teeth to prevent too much jumping, the ground should be nicely consolidated, and no further cultivation necessary until seeding time—provided no rain falls to set the surface—for the scrub rake leaves a nice mulch quite deep enough for covering the seed.

Rolling down with Horses.
(Block by "Geraldton Guardian.")

Should the land be timbered with mallee scrub which requires to be rolled, the settler will probably desire to burn off as soon as possible after rolling has been completed. This should take place about three weeks after the scrub is knocked down and before the gas escapes from the wood, when it will be found to burn best. If the spring-backs have been cut before the firing, the ground should be fit for ploughing within a day or two, which might be employed stump cutting.

Land rolled in winter and left until the following summer, after it has suckered, will not give so clean a burn, although more than half the shoots

will be destroyed. If the land be cleared and cropped straight away at harvest the mallee shoots will be very bad, and if the settler can possibly spare the time he should go around with a slasher and cut the tops off the shoots about eight inches from the ground, early in January, and they will then have shot a second time before the straw is burned. This method serves to kill most of them out right.

In dealing with the heavier timbers such as ti-tree, paper bark, and mallee from 10 to 20 feet in height, my experience, after having rolled some 2,000 acres, is that the design of the roller to be used is most important. It must be strong, without being unwieldy or unnecessarily heavy.

There are two distinct types of rollers—the roller with a *skid* or *wheel* in front to support the frame, and that with a *balanced* frame. As the former is now out of date, I will deal only with the latter.

Rolling down with Tractor.
(Block by "Geraldton Guardian.")

An endeavour should be made to get a boiler about 3ft. 6in. to 4ft. high, and about 9 or 10 feet long, having an axle inserted and fitted with T irons about every foot apart. This type will be found quite heavy enough to roll the heaviest timber. I have seen rollers 6ft. 6in. in height and with a length of 9ft., but these have a tendency to tip up, being too narrow for their height, as it is necessary to have a length at least double the height.

One of the outstanding features necessary to success is that of frame construction. Quite apart from the fact that a wheel is always suffering damage from stumps, etc., when turning corners, a roller weighing two tons will do better work if so constructed that the weight of the frame is balanced on the boiler, than one of three tons weight requiring a front wheel, as at least half the weight of the roller is thrown on the front wheel when passing over a stump.

Assuming the boiler to be 3ft. 6in. high by 9ft. wide, the settler will find the construction shown in the accompanying photograph very satisfactory. It is essential to get good strong rails, not less than 6in. diameter, of which about 8 or 10 are required, the longest being 18 or 20 feet and the shortest about 2 feet.

First required in construction are two blocks of about 2ft. long, as shown marked "A," through which to pass the axle. Two more as shown marked "B" are next required, that on the near side to be 18 or 19 feet

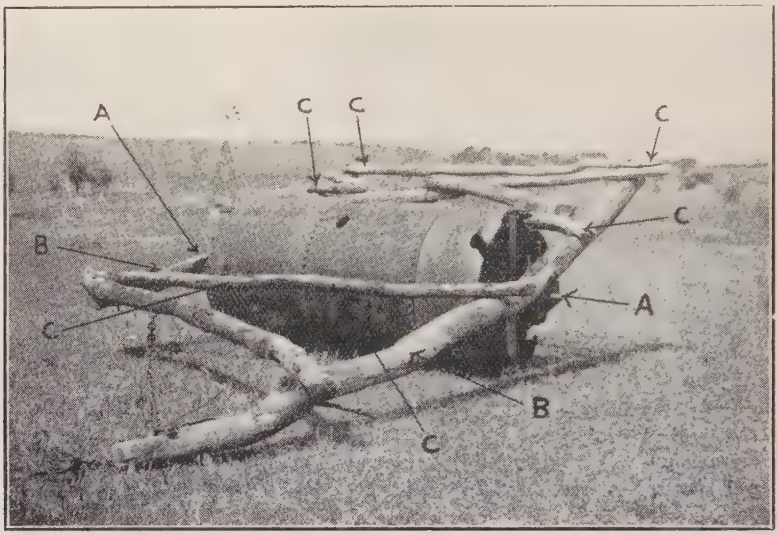


Fig. 3.

long and not less than 5in. at the small end, and that on the off side 8ft. 6in. long and not less than 8in. diameter. Having bolted these to the blocks on the axle, one-third of the long rail "B" being at the back and two-thirds forward, the short rail being centred or half each way. Next required are the three rails marked "C," 11ft. long and 5in. diameter. Two of these are bolted to about 9in. on either side of the boiler and the third at the rear of the frame. The last rail—except perhaps a light stay across the diagonal of the frame at the rear, which is optional, is the breaker rail marked "D," being very important and requiring to be very solid. This rail must not be straight, but must have a good bend in towards the roller, otherwise it will slip off the timber. This is bolted about 7 feet 6 inches from the boiler diagonally across to the off side of the frame and about 2ft. 6in. from the end of the pole "B." Three-quarter inch iron is necessary for bolts. A stout chain is then required of about 24ft. in length, to pass around the off-side of the frame, through a large link, then across and through a shackle on the end of the pole. The frame should be adjusted so that the front and back portions practically balance each other, as the illustration herein indicates. It will probably be necessary to place a log or two at the back so that the addition of a few pounds weight there will cause the front to lift. A roller of this size, in very heavy timber, will be found quite weighty

enough for the average tractor, or six or eight horse team. Horses when used require to be worked two abreast. All timber over five inches in diameter should be nicked on the side farthest from the approaching roller, when it will then break clean.

Fig. 4.

PHYSICAL CONDITION OF SOIL.

B. L. Southern, A.A.C.I.

From the very earliest times, primitive man, when he realised the usefulness of growing food for his own use, unconsciously considered the physical nature of his soil. To save his seed from the birds it was necessary for him to break the surface of the ground and bury it, thus making a seed bed by breaking up coarse particles into finer ones. The necessity for making a good seed bed was soon realised to be of extreme importance, and implements were devised to cultivate the land more efficiently. The ancient Egyptians and Greeks were great agriculturists, and records remain of their efforts to improve their soils and obtain heavier crops. Early English writers give accounts of methods used to increase yields, but it is only in recent years that the whys and wherefores have been understood.

Since the discovery, about the middle of the last century, of the soil constituents taken in by plants, the tendency has been to place too much reliance on the chemical nature of soil rather than on the physical, but recently, as our knowledge of the chemical side has improved, the physical side is demanding more and more attention. It has been established beyond all doubt that if a soil contains all the elements required for successful plant

growth, the plant will not thrive if the physical condition of the soil is bad. A young plant may be likened to a child. A child, however well nourished, will not grow up a healthy adult if brought up in unhealthy surroundings, such as being confined to slums, in smoke-laden cities, or—an extreme case—to a room which the sun never enters. The seedling must have open soil through which air and water have a suitable circulation. A soil providing this may be said to have a good physical condition.

To make the subject clearer, a few examples will help to explain the word "physical." When water is boiled it turns into steam, the steam if played upon a cold surface forms water again; such a change is known as a "physical" one. Water and steam differ in appearance, but are nevertheless composed of the same substances—hydrogen and oxygen. When a piece of wood is burnt a little ash remains while the remainder combined with atmospheric oxygen is lost in the air as gases and smoke. Such a change is a "chemical" one, and differs totally from the "physical" one. If a lump of clay is broken down to a fine dust the change is "physical," *i.e.*, the clay is still clay, but in the form of a powder instead of a compact mass.

The chief factors concerned with a good physical condition of soil are:—

(a) the size of the grains or particles;
(b) materials binding the particles together.

The size of the particles can be controlled by cultivation, although in some cases this is impossible. It is possible to add binding materials to a loose soil or break down the binding of heavy compact soil.

It is portion of the work of the soil chemist to determine the size and quantities of the various soil particles. Soils may be classed roughly under three headings:—

(a) Sandy or light soil.
(b) Loam or medium soil.
(c) Clay or heavy soil.

Sandy soils contain excess of an inert substance known as silica and very little binding material, such as humus or clay. They are for the most part easy to work in the sense of turning the soil over, but difficult to work economically because of their lack of plant foods and their poor physical condition. Owing to the comparatively large size of the particles and spaces between them, water drains and evaporates through them rapidly, and very little is retained by the soil, little water rises to the surface from the subsoil due to a low capillary attraction.

Loam soils are a mixture of sand and clay, they contain consequently coarse particles which tend to keep the soil open, and clay particles having a binding action. Generally speaking they are richer in humus than sandy soils. Water passes freely through them but not too rapidly, consequently they hold more moisture. Capillary water rises higher, due to the smaller particles.

Clay soils contain an excess of fine particles, which bind firmly together making the passage of water difficult and preventing the free passage of air and easy penetration by rootlets.

The following table shows the composition of typical soils:—

	Sand	Loam	Clay
	%	%	%
Coarse particles (sand) ..	55.3	27.6	9.0
Medium particles (silt) ..	40.5	41.7	43.0
Fine particles (clay) ..	4.2	30.7	48.0

The principal binding materials of soils are clay and humus, and to a lesser degree iron oxide (rust). Lime is a binding agent in loose sandy soils, but has the opposite effect in heavy soils.

Humus is vegetable mould formed by the rotting of organic matter such as dried leaves and twigs when exposed to moisture and the free action of bacteria. Apart from the fact that it binds soil particles together, it retains soluble plant foods and prevents them from being washed far into the subsoil, particularly in light lands; in other words, if a fertiliser is added to a soil, humus prevents it from being washed out after heavy rain. The action is a colloidal one, which will be dealt with more fully under clay. The humus content of a soil may be increased by adding organic matter; this is done directly as in green manuring—the ploughing in of green crops, or indirectly by ploughing in remains of former crops, or as the general rule in this State is to feed off stubbles with live stock, the animal droppings being returned to the soil as organic materials. It is a very bad practice, particularly in our light land areas, to burn off stubbles, for not only is valuable humus lost but also nitrogen, one of the chief fertilisers.

The binding action of carbonate of lime depends on the fact that lime is slightly soluble in water containing carbonic acid gas derived from the atmosphere and decaying organic matter in the soil. When most of the water evaporates the lime settles out in little crystals, which cling to the soil particles holding them together. Iron oxide under certain conditions has the power to bind small aggregates of fine soil together, thus preventing them from caking into one hard mass.

The beneficial action of clay depends upon its colloidal properties. For our purposes it will be sufficient to say a colloid is a substance which, on mixing with water, breaks up into extremely small particles which may take weeks to settle, or in some cases will never settle out, leaving a perfectly clear liquid. Colloids absorb water and swell up and contract again on drying; this is one of the reasons why clay soils hold so much water, a very desirable feature. The fact that colloids swell when damp makes them more compact, with the result that it is very difficult for air and water to penetrate them. The soil in fact becomes water-logged, and where the amount of clay is excessive any amount of drainage may fail to rectify matters, and the plant dies from suffocation. Fortunately, we have simple methods of breaking down the harmful colloidal conditions which arise in heavy clay soils. When certain substances in solution are added to clay suspensions, the clay particles cluster together (coagulate) and settle down, *i.e.*, the clay loses its colloidal properties. Two of these coagulating agents, namely lime and gypsum, are easily obtainable and relatively cheap, so they fall within the range of economic working. Fresh slaked lime is more effective than old lime, which is rather insoluble except in water containing carbon dioxide. When these compounds are added to the soil the finer particles coagulate when the rains come, and water finds its way readily through the larger soil spaces. Water soluble plant foods have the power, like lime and gypsum, to coagulate clays in varying amounts, but in doing so some of the dissolved material is retained by the clay, hence all of it is not washed out even if the drainage is very effective. Humus will bind clay particles together, thus making the soil more open and porous. Sand will open up clay in a mechanical way, thus making the soil easier to work, and we can similarly approach the ideal soil by adding clay to sand.

(*To be continued.*)

IRRIGATION.

(Part II.)

A. R. C. Clifton,
Officer in Charge of Irrigation.

The different methods of applying water and the implements used in preparing the land for irrigation have been described, but before passing on to the question of grading it is necessary to touch on the planning out of the scheme, the general lay-out of which will depend on the conditions.

PLANNING OUT THE SCHEME.

The position of the ditches should first be determined and plotted on the contour plan; these should always be placed along the highest portion of the farm so as to make the largest possible areas irrigable.

This appears to be so obvious that it seems unnecessary to mention it, yet owing to lack of experience a farmer will sometimes run his channels direct from the source of supply to the best piece of land, overlooking the possibility of perhaps desiring to extend the scheme at some future date or the value of less favourable land past which the channel is taken, thereby leaving a useful area high and dry above the supply ditch. Later, when it becomes advisable to extend the irrigation area, a new ditch has to be built, and consequent expenses incurred which would not have been necessary had the channeling been constructed in the proper position at the commencement. The distance apart of the ditches depends on the contour of the land, and whether it is to be watered by furrows or flooded.

In the former instance the furrows may be up to 10 chains in length, but for economical watering five to six chains will be found best. Where the land is porous or fairly level, the furrows should be shorter than where it is less permeable to water or has more fall.

The same factors apply when flooding, but the size and shape of the checks or borders will also depend on the head of water available and the contour of the land. For instance, where it is not possible to run the borders at right angles to the contours, it is obvious that one side will be higher than the other—the wider the plot the greater the difference—therefore, the amount of soil that must be shifted to make the land level between the checkbanks is directly influenced by the width of the borders.

This will be better understood by studying the lay-out of the contour plan, shown in figure 24.

The land which now comprises plots Nos. 1, 2 and 3 was originally one area laid out and graded for furrow irrigation, and watered from ditch No. 1 —the furrows being six chains long. This area was later divided into the plots, and put down to lucerne under the border method.

The borders in Plot No. 3 are 15ft. wide by 400ft. long. The reason for making them so narrow was to reduce the grading as much as possible on account of the heavy fall sideways. The soil was inclined to be on the heavy side and this, together with the fall down the plot, was compensated for by making the borders extra long.

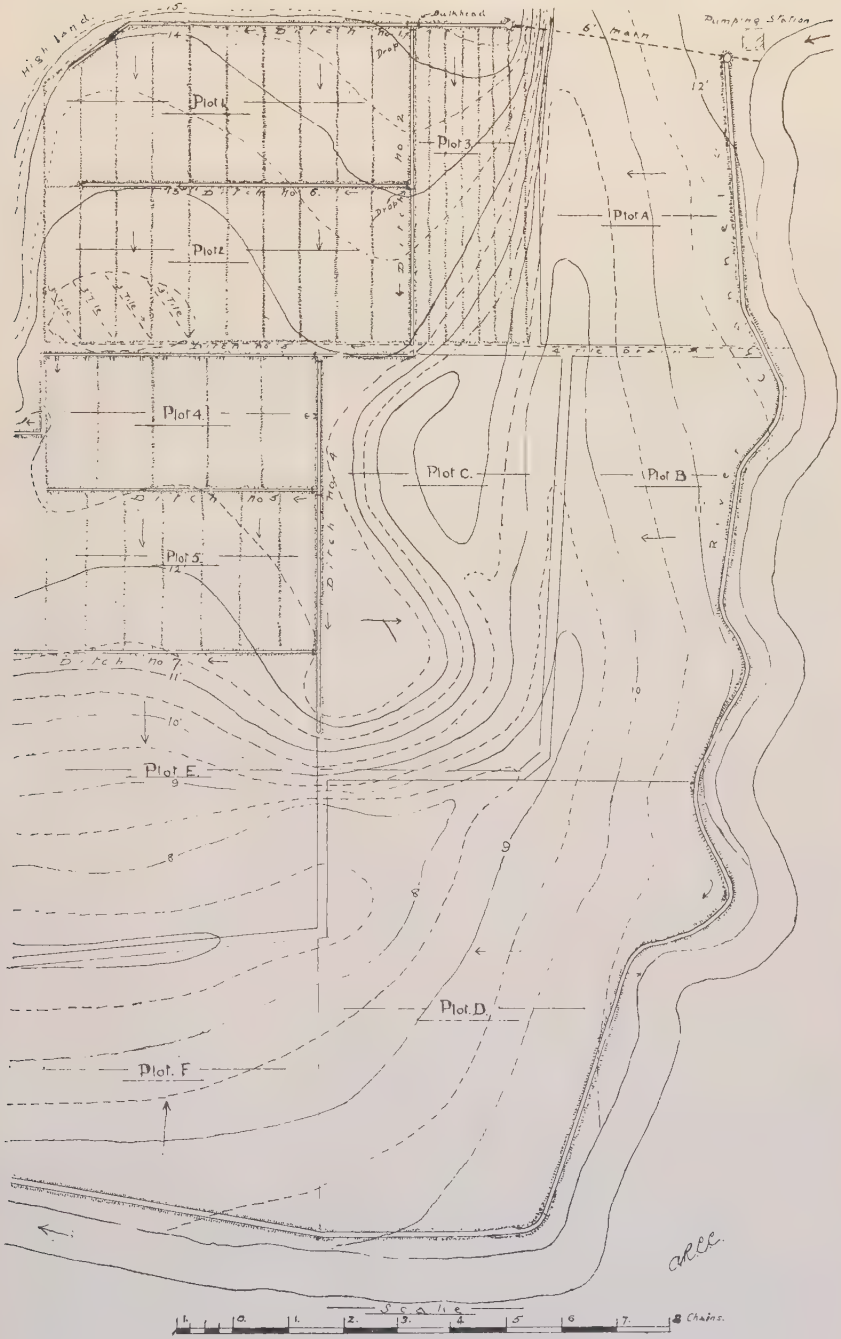


Fig. 24.—Irrigation Plan, showing contours and general lay-out.

This length was too great, however, for the economical watering of the rest of the area on the other side of the No. 2 ditch, as the land there was more porous and had less fall. This area was, therefore, divided into two sections (marked 1 and 2 on the plan) by ditch No. 6, and laid out with

Fig. 25.—The grading of land in this condition is costly.

borders 44ft. x 200ft. These borders could have been made wider, as far as the head of water was concerned, but it was not economical to do this from a grading point of view, owing to the extra work required to make wider borders level between the levees.

Fig. 26.—Clean well-worked land. Ideal conditions for grading.

The same remarks apply to plot No. 5.

Plot No. 4 was laid out in level checks, and as one-fourth acre was the maximum area that could be economically flooded at one time with the head of water available on this class of soil, they were made 66ft. by 165ft. The contour had no bearing on the size of these checks as the land was level.

The remainder of the block was under furrow irrigation, the length of furrows varying from three to seven chains, according to the lay of the land.

The foregoing illustrates how the texture and contour of the land, together with the head of water available, influence the size and shape of checks or borders as well as the length of furrows.

Fig. 27.—Channel built in level section.

The head of the water available on this scheme was 30,000 gallons per hour. The land had good natural drainage, and varied from deep black alluvial soil to a rather heavy red loam. The cost of grading, including the channel sites was from £1 to £7 per acre.

PREPARING THE LAND FOR GRADING.

The area to be graded must be deeply ploughed, and all stumps and rubbish removed. The ploughing should be in the direction of the fall, as the furrows will be filled in with less work than if the ploughing is across the slope of the field. Any dead grass or stubble should be burnt off beforehand, as the grading implements will only work in clean land. It is, however, advisable to do the ploughing with a mouldboard plough in the spring while the weeds, etc., are still green, as they will then be well turned in and rotted before the grading commences.

The land should be worked and never allowed to get in the condition as shown in fig. 25. This was very heavy land left untouched after being ploughed, consequently the cost of grading was much increased owing to the necessity of having to keep going over the same area to try and spread the soil evenly; also, owing to the rough condition in which it was left, all moisture had gone out of the sub-soil, making it very difficult to replough the high spots after the first ploughing had been removed. Compare fig. 25 with the state of the land in fig. 26, and the difference in the condition of

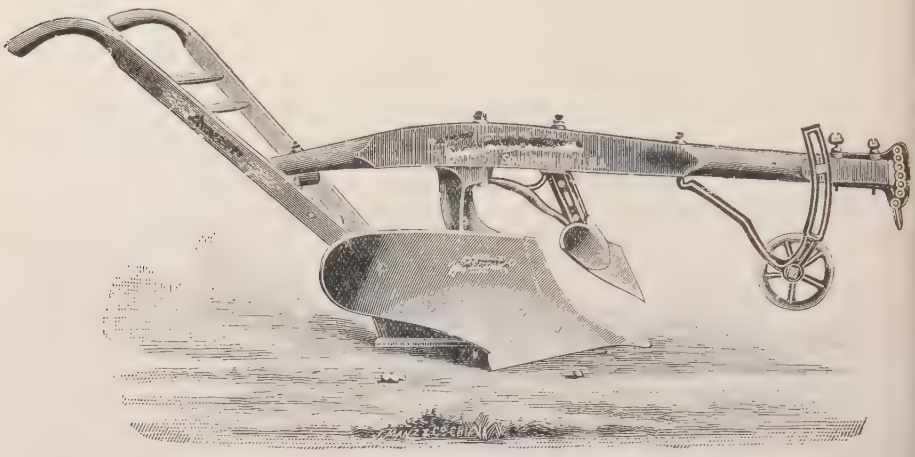


Fig. 28.—Handy type of plough to use in connection with grading operations.

grading will be appreciated. In the latter instance full loads can be lifted and spread evenly wherever desired, enabling accurate work to be performed.

Though the preliminary work should be done in the spring, the actual work of grading is essentially a summer job, and should only be undertaken when the land is dry, otherwise—

(a) it will be impossible to spread the soil evenly;
(b) the work will be very heavy on both the horses and operator;
(c) time will be lost in continually clearing the sticky soil from the implements;
(d) the land will be so compacted that it will quickly become impossible to pick up the soil;

consequently more harm than good will be done, and at the best only a second-class job at a high cost will result.

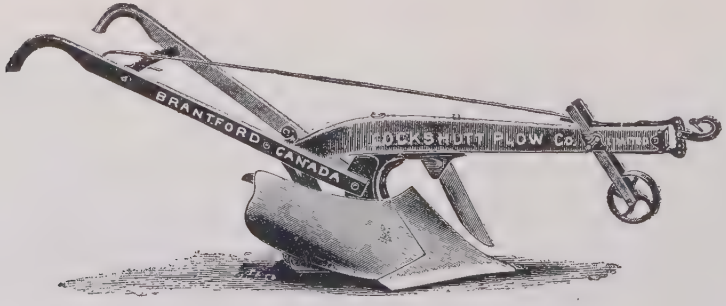


Fig. 29.—Reversible hillside plough.

CHANNEL SITES.

Before commencing the grading, the position of the channels to serve the area should be determined and permanently marked on the land, by crowning up the sites with a single furrow plough 9ft. or 12ft. wide; this also serves to raise the channel sites, on which there should be sufficient spoil to enable the ditches to be constructed by using the dirt from the centre to form the banks without having to make the ditches unnecessarily wide or deep.

It is necessary to head the water up higher in the ditch for flooding than for furrow irrigation, as the water flows out on to the surface of the land in the former instance, whereas in the latter it flows out at the level of the bottom of the irrigating furrows, therefore, the channel sites must be made stronger for flooding than for the furrow system. Crowning up the

Fig. 30.—Borders partially graded.

channel sites two or three times with the plough will be of assistance in connection with the former.

The whole area should then be smoothed off and all furrows filled in with the slicker or smoother, taking particular care not only to fill in the furrows left along the sides of the channel sites, but also to deposit spoil on the channel sites as well.

It will be found advisable to work diagonally across the ploughing, but crossing all the channel sites at right angles so that no damage will be done to them. This operation should commence near one corner of the field by striking out a 10-yard "land" with the slicker, the next round following on the first, keeping the upward and downward trips of each round not less than half-a-chain apart. By working right across the field in this manner, short turning with the team will be avoided, and after the first land is covered the rest of the field will be gone over twice on the same angle, but from opposite ends of the lands.

Though it may be unnecessary to go to the trouble of smoothing off before using the buck-scraper, it is strongly recommended as apart from strengthening the channel sites, it not only helps to pulverise the soil, but also makes the irregularities of the land more easily detected, thus facilitating the buck-scraper work. It will also get the team in good working order, which is important, as it frequently happens that small land owners do not possess four good horses, and the team has to be made up by borrowing or hiring from a neighbour.

The field will now have the appearance of a smooth surface with all furrows obliterated, the position of the channels being marked by low banks or mounds throughout the area. The channel sites should then be checked with a dumpy level, and the grades worked out: these will depend on the

Fig. 31.—Flooding well-graded land.

conditions, and will vary up to 1½in. per chain. Most fall will be required where only small heads of water are available, and the ditches are long. The main object is to prevent scour, and to have the water well under control. The larger the head of water, the less fall will be required. When the land has more fall than desirable for the ditch, the grade is worked out in sections and stepped down from one level to another by means of drops. (Fig. 27.)

The low parts of the channel sites must now be built up with the buck-scraper by pulling down the high parts, and, if necessary, robbing the further spoil from the high spots in the field. If the latter is necessary, and it is intended to grade for irrigation by flooding the position of the borders or checks should be marked out with a plough so as to readily determine where spoil can be obtained for the "fill," and at the same time assist in grading the plot.

Fig. 32.—Land graded for the border method.

Fig. 33.—Irrigating ditch and head furrow.

The finished channel site has the appearance of a graded railway track ready to receive the plates, consisting of miniature embankments and cuttings where it passes over depressions or goes through rising ground. The embankments or "fills" should be made strong to allow for settling.

Too much care cannot be taken in connection with the channel sites, for the channeling is a most important factor in the successful operating of the scheme. Serious loss may occur through wash-aways and the necessary spoil to repair the breach is often difficult to find.

When it is not practicable to convey the water across a depression by means of an earth embankment, owing to it being too deep or through lack of spoil, piping or fluming can be used.

Fig. 34.—A well-graded citrus orchard.

As soon as the channel sites are finished, the borders or check-banks should be made by ploughing up three rounds with a single furrow plough; these should be crowned up as high as possible. The type of plough shown in fig. 28 will be found best suited for the purpose. These ploughs being light and easily handled are specially useful in connection with grading operations as they can get into the odd corners which frequently occur when preparing the ground.

GRADING.

Where there is much levelling to be done on the plots, it is advisable to mark the position of the check-banks with just a single furrow, and do the rough-grading before permanently making the banks, otherwise they would get damaged with the grading implements. When the checks are narrow, it will facilitate the work to mark out every second bank, and first do the rough grading of two plots at once.

The grading is done by driving the scraper up and down the plot or border in the form of a series of figure "eights," picking up the soil alongside the check-banks on the high side and spreading it against the bank on the low side. Where there is a fairly uniform slope sideways, a great deal of scraper work can be saved by using a reversible plough (fig. 29). Most of the levelling of the borders in Plot 3 (fig. 24), was done by ploughing each plot away from the high side with one of these implements.

Fig. 35.—Ploughed-out ditch for furrow irrigation.

This type of plough is very useful on an irrigation farm, as the land can be prepared for the different crops without leaving any furrows.

Fig. 30 shows the rough grading finished ready to have the check-banks ploughed out.

When this is done the borders should be trimmed up, and the levelling between the banks made as perfect as possible so that the water will spread evenly over the surface (fig. 31). The furrows left along the sides of the banks should be filled in by driving the scraper or the slicker on an angle alongside.

Fig. 32 shows the plots after the grading has been completed. The check-banks should be harrowed down so that they are not less than 4ft. wide by 6in. high. It is better to have them too big rather than too small, as weak banks enable the water to flow over on to the next plot and it will then be found almost impossible to irrigate the land.

Fig. 36.—Ploughed-out ditch for flooding.

If furrow irrigation is to be practised, no check-banks will be required, before commencing grading however, it is advisable to plough parallel furrows every chain or so apart in the direction the irrigation furrows are to run; this will enable the work to be easily kept on the right grade, and will also show up the inequalities of the soil.

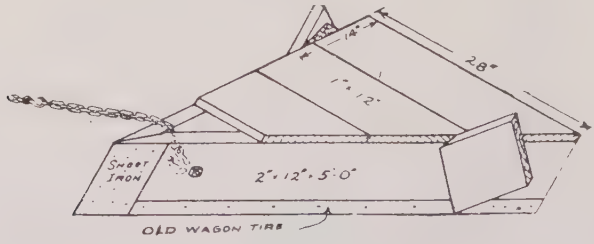


Fig. 37.—Home-made Crowder.

The buck-scraper should be worked parallel with these furrows all the time, the object being to grade the land so that the water will flow from the ditch to the end of the irrigating furrow; slight undulations across the field do not matter.

If the grading is heavy it will be necessary to replough the high portions to enable the buck-scraper to pick up the soil. The reploughing should be done, however, before the land has been scraped bare, so that all the surface soil will not be removed.

Fig. 38.—Ditch formed with plough and crowder.

Care should be taken to have plenty of spoil against the channels (fig. 33), as depressions on the headlands are troublesome when watering, and make the control of the water difficult. Fig. 34 shows a properly graded orchard for furrow irrigation.

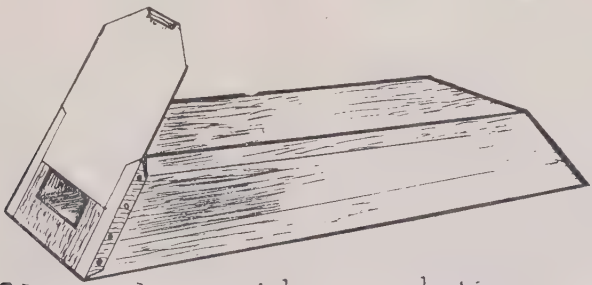


Fig. 39.

The grading and preparation of the land for irrigation is the most important work, and involves more time and labour than anything else in connection with the scheme. By making the levelling as perfect as possible, not

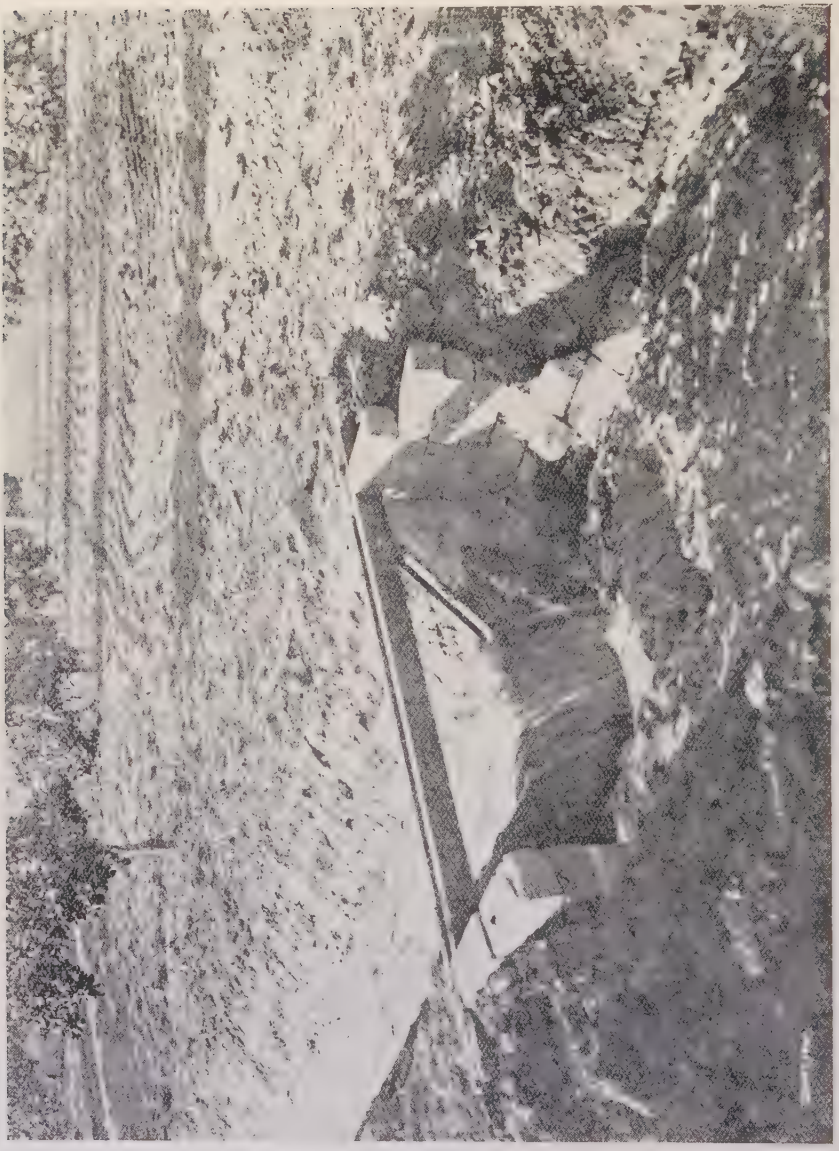


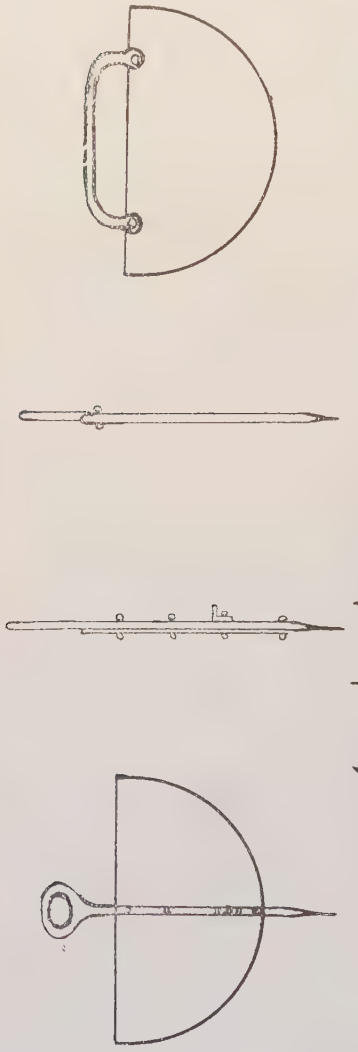
Fig. 40.—Drop made of timber and loose bricks.

Fig. 41.—Cement drop.

Fig. 42.—Cement drop, showing method of regulating the stream.

only will much labour and inconvenience in irrigating be avoided, but it will also enable the water to be applied more evenly.

The injurious effects of trying to irrigate an uneven surface are soon apparent; the water collects in the low places, puddling and water-logging the soil and ultimately ruining it, whilst other portions of the field receive an insufficient supply. It may also become necessary to have three or four men to handle the same stream, which could be handled on a similar area by one man if the land has been properly graded.



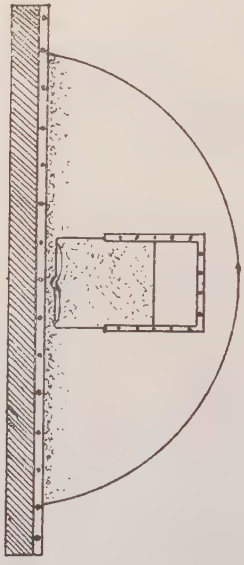


Fig. 43.

CHANNELLING.

If the sites for the ditches have been properly graded the channels can be formed with a plough, and very little handwork will be required for trimming afterwards (figs. 35 and 36).

The crowder (fig. 37) will be found useful for forming larger ditches. This is drawn by two horses along the bottom of the ditch after it has been ploughed out (fig. 38).

The outlet boxes (fig. 39) and drops (fig. 40) should now be placed in position, and well rammed.

Drops can be made of concrete (fig. 41) or wood. To prevent any erosion, the ditch should be lined with concrete or bricks immediately above and below the drop, and a small sump should be provided on the low side to

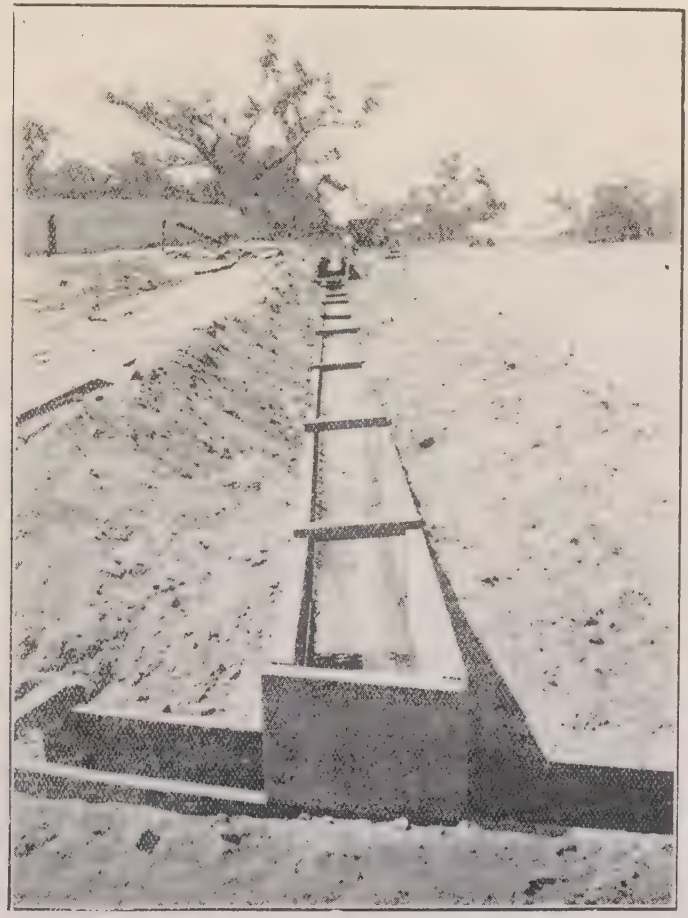


Fig. 44.—Ditch lined with timber to prevent scour and seepage.

steady up the flow of water. It is also necessary to make provision for placing regulating boards in the channel to enable the stream to be headed up or divided (fig. 42). Elsewhere metal tappons (fig. 43) can be used for this purpose.

Where the soil is porous, and seepage likely to occur, it is necessary to line the ditches with clay, wood (fig. 44), or cement (fig. 45).

In orchards, concrete distributing ditches are generally formed with a bottom width from 6in. to 18in. by about the same depth, and with side slopes of ½in. to 1in.; in some cases no slope is given, the sides being vertical.

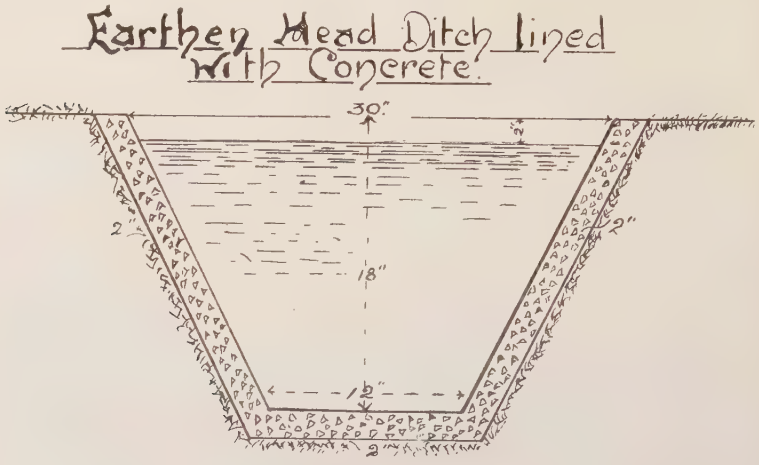


Fig. 45.

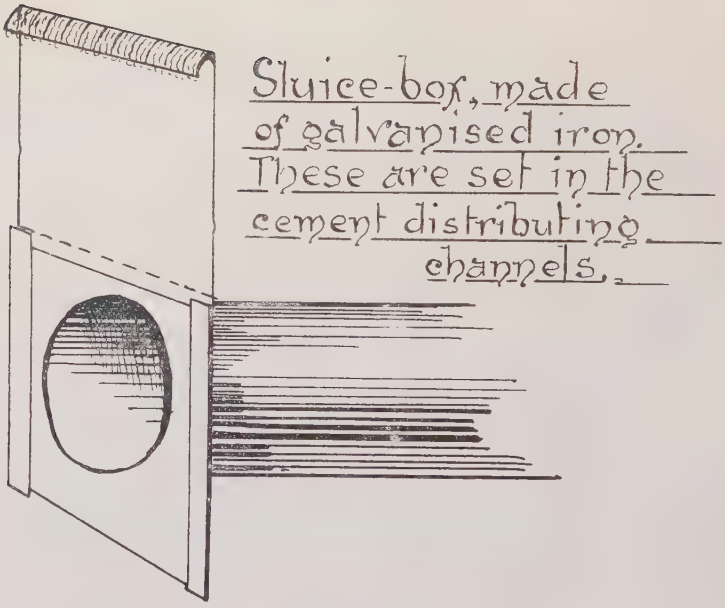


Fig. 46.

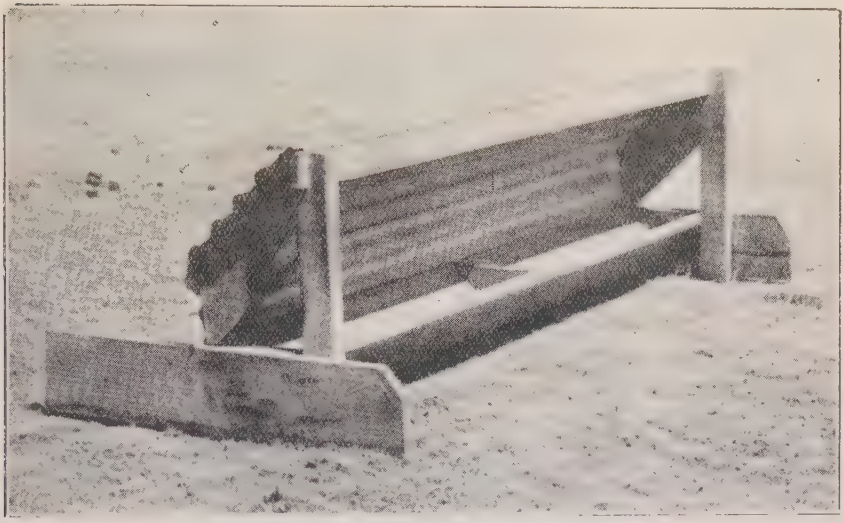
To divert the water from the ditch to furrows, short regulating tubes (fig. 46), are embedded in the concrete at suitable distances. Where there is a heavy fall, cement bars or ledges are made in the bottom of the ditch forming small basins opposite each regulating tube, enabling the water to flow out into the furrows.

(Part III. to follow.)

THE "DALIAK" LICK TROUGH.

Geo. L. Sutton,
Director of Agriculture.

The advantage of providing sheep with a salt lick is now so very generally recognised that the description of a simple trough which provides the necessary protection of the lick from the weather, and at the same time gives easy access to it for the stock, is likely to be of interest. Such a trough was seen on a recent visit to "Daliak," the property of A. J. Monger, Esq., of York, and is illustrated herewith.



The "Daliak" Lick Trough.

The trough is six feet long, and experience has indicated that it provides adequate facilities for about 200 to 250 sheep. It is, however, so portable that it is considered this size might be made a standard or unit, and for larger flocks in the same paddock, a number of troughs of this size might be used rather than a single larger one. The use of a number of troughs would have the advantage that they could be placed in different parts of the paddock, and thus the stock would have less distance to travel to them than if fewer were used.

Obviously this trough should be placed with the iron protection against the quarter from which the bulk of the rain is expected.

In the photograph of the trough herewith it will be seen that the ends are only partially enclosed; it as been found that this permits sheep attempting to feed from the ends, and is a disadvantage. In the diagram herewith showing the constructional details of the trough, provision has been made for entirely closing the ends.

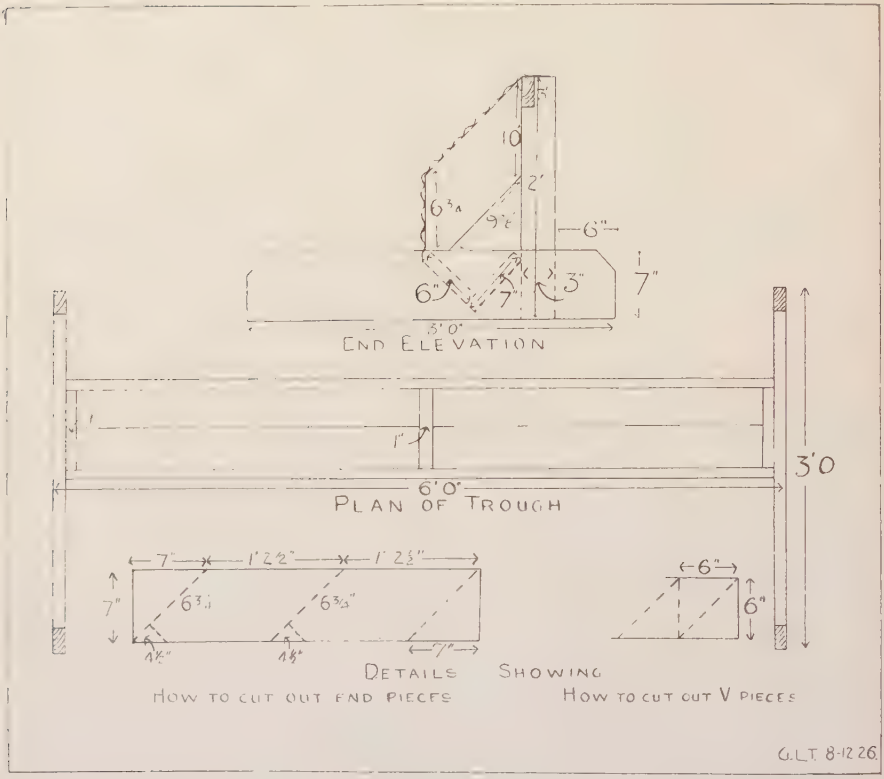


Diagram showing the construction of the "Daliak" Lick Trough.

It is likely any person handy with tools will be able to make this trough without difficulty from the diagram given. The quantities and material required are as hereunder:—

Hardwood	3in x 1in.	1 x 6ft. 0in.
	3in. x 2in.	2 x 2ft. 0in.
	7in. x 1in.	1 x 6ft. 0in.
		2 x 3ft. 0in.
		1 x 3ft. 0in.
	6in. x 1in.	1 x 7ft. 0in.

Galvanised corrugated iron—1 sheet 6ft. 0in.

Roofing nails, 2in. or 2½in.—½ packet.

Wire nails, 2in x 10in.—1 lb.

A lick recommended by the Chief Veterinary Officer, and known as the 4.10.40, has the following composition by weight:—

Sulphate of iron—4 parts.

Sterilised bone meal, or superphosphate, or air slaked lime—10 parts.

Coarse salt—40 parts.

FARMERS' FIELD TRIALS.

SOUTHERN CROSS.

H. Rudall—Field Officer.

Farmers' Field Trials were carried out during the last season at this centre on the farm of Mr. E. H. Richards. The area of each plot was half an acre, and this was repeated twice.

The rainfall for 1926 is as under

Jan	Feb	Mar.	April.	Growing Period.						Nov	Total.
				May.	June.	July.	Aug.	Sept.	Oct		
..	20	362	221	51	164	228	68	54	68	90	1,326

CULTURAL NOTES.

Ploughed June, 1925, with mouldboard plough, 3in. deep; cultivated with Springtyne October; harrowed January, 1926; cultivated with Springtyne twice in March, and harrowed early in May. Sown 14th May; Variety Trial 45lbs. seed and 75lbs. superphosphate.

In the tables below are given the computed yields per acre of the different plots:—

VARIETY TRIAL.

Plots half an acre.

Variety.	Computed yield per acre.	
	bus.	lbs.
S.H.J	17	20
Gluyas Early (Control)	22	40
Merredin 15	17	56
S.H.J.	17	56
Gluyas Early (Control)	20	4
Merredin 15	17	4

RATE OF SEED.

Variety "Merredin."

Plots half an acre.

Rate of Seed.	Computed yield per acre.	
	bus.	lbs.
60lbs.	15	58
45lbs. (control)	14	0
90lbs.	8	24
60lbs.	11	30
45lbs. (control)	10	36
90lbs.	6	32

RATE OF SUPERPHOSPHATE.

Variety "Merredin."

Plots half an acre.

Rate of Super.	Computed yield per acre.	
	bus.	lbs.
150lbs	9	12
75lbs. (control)	13	16
225lbs.	11	4
150lbs.	8	40
75lbs. (control)	8	20
225lbs.	2	48*

* The yield of this plot is so obviously inconsistent that factors other than the fertiliser must have been at work.

BLACK MEDIC, OR ENGLISH TREFOIL.

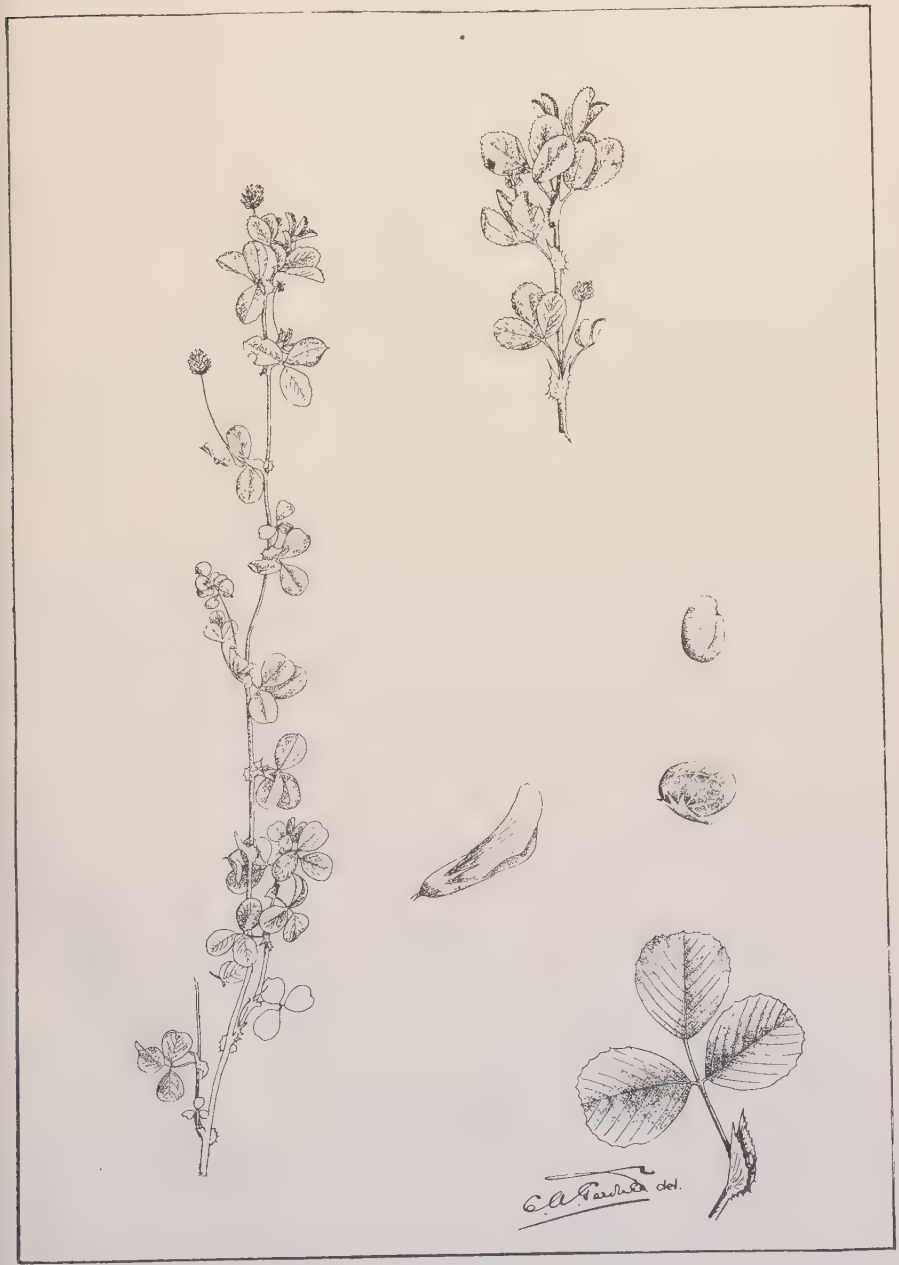
(*Medicago lupulina*, Linn.)

W. M. Carne, F.L.S., and C. A. Gardner.

Black Medic is a small procumbent or almost prostrate annual clover-like plant, stocked by most seedsman, and sometimes grown, but is of little importance as a pasture plant.

Description of Plant.—A pubescent trailing annual or biennial clover-like plant, seldom more than a few inches high, and spreading to several feet in diameter. Leaflets obovate, toothed, Flowers, yellow, small, several clustered together into egg-shaped heads with a slender stalk usually larger than the leaf. Pod small, one seeded, kidney shaped, not prickly, becoming almost black when ripe, with sides with conspicuous concentric veins.

The plant is naturalised in several places. Its original home is Europe and temperate Asia.



Black Medic or English Trefoil.
(*Medicago lupulina.*)

BREAD MAKING.

Margaret A. Wylie, Inspectress and Organiser Domestic Science, Education Department.

The science of bread making involves some knowledge of both Chemistry and Physics. A complete study of this art, therefore, necessitates familiarity with some of the fundamental principles of these sciences. Though bread has been made for countless ages, and has been the staple food of man, its successful making has been really the result of knowledge gained empirically. Modern hygiene has, however, demanded a more definite basis to justify its continuance as the main part of human diet.

Flour.—Of all cereals, wheat yields the best flour for bread. This is due to the fact that it is the only grain which contains the constituent gluten in the proper proportion and of the desired quality essential for turning out light, spongy bread. Flour also contains a large proportion of starch. The following is a simple test of their presence:—A cupful of white flour in a muslin bag, if saturated with water and pressed, leaves a yellowish, tough, elastic substance in the bag, somewhat the size of a walnut. This is the gluten, the starch having been expelled. This experiment gives a rough estimate of the proportion of gluten to starch in a standard flour.

White flours are classified differently in different countries. There is the millers' classification, the classification for commercial convenience in buying and selling, but the housewives' classification is from a very different standpoint, and should be as follows:—

1. Strong or old flour.
2. New flour.
3. Fine flour.
4. Weak or feeble bodied flour.

The first is of a deep, creamy colour, the kind that tumbles in a fluffy light manner out of a bag. If examined with a microscope, its gluten cell walls will be found to be very strong, having power to hold the gases that are formed by the action of yeast. Old flour is dry, and will absorb a large proportion of water.

The second type is whiter than the above and on account of its inherent dampness absorbs less water. It may be noticed that some flours retain their shape when pressed, an invariable sign that the flour is new.

The third, fine flour, is soft and elastic, not spongy and puffy, and producing a smaller loaf to the same proportion of flour. Its gluten is usually plentiful, its flavour in general being fine and "nutty."

Weak or feeble bodied is deficient in gluten, and hence in the capacity to retain the gases produced by the action of yeast, as well in the power of absorbing moisture.

Strong flours therefore are most suitable for bread, fine flours for Christmas cakes, short pastes and short bread.

Yeast.—The article on jam making showed that various moulds and bacteria were the cause of decomposition and putrefaction of foods, and how the spores of moulds float about in the air. It must be remembered, however, that as well as harmful organisms, the air around furnishes useful bacteria. Wine, vinegar, and cheese are the result of these bacteria, properly employed.

Yeast also enters this category. It is a minute plant of the "fungi" family, so small that one million would cover only one cubic inch. Warmth and moisture speed its growth, its food being the sugar formed from starch. It thrives best at 78deg. F. Its chief power is that of changing starch to sugar, and then converting the sugar into alcohol and carbonic acid gas. Provided the right food and conditions are given it, yeast propagates rapidly, at the rate of one million an hour.

The gas generated by the action of the yeast is all important in bread making, for it is that which causes the sponge to rise, striving as it does to escape from its imprisonment in the gluten cells. It is possible to classify yeasts thus:—

(a) Liquid yeast.
(b) Distillers' yeast.
(c) German or compressed yeast.
(d) Dried yeast.
(e) A semi-dried form called putty yeast.

Liquid yeast is cultivated from a mixture of potatoes, sugar, water, and hops.

Distillers' or brewers' yeast is a natural type, skimmed from fermented rye.

German or compressed yeast is bought in cakes, chiefly in England or the Continent of Europe. Unfortunately this often spoils in transit through the tropics.

The dried variety is made from hops and potatoes, mixed with starch and pressed into cakes.

The last type is built up in layers of semi-dried yeast.

Hops.—Hops act as an antiseptic, *i.e.*, they help to destroy the power of certain bacteria and prevent thus the propagation of wild yeast. Consequently it is advisable to use yeast made from hops, as the use of poor potatoes and impure materials produces wild yeasts which spoil bread. As well as this negative use, hops improve the flavour of the bread.

To ensure really successful bread the making of yeast should be attended with every care and cleanliness. An old bottle (used before) can be used, but the corks and fittings must be perfectly clean, as the entry of foreign germs tends to spoil the value of the true yeast and start different cultures.

Preparation of Yeast.

Hop Yeast.—1 large potato, 1 pint water, 1 tablespoon sugar, 1 tablespoon flour, 1 teaspoon hops.

Method.—1. Boil potato, add hops while still boiling. Boil 20 minutes.
2. Strain, cool slightly, add flour and sugar.
3. Bottle and cork tightly.

4. The yeast should work in a few hours in a bottle previously used for yeast, 24 hours in a new bottle.

5. A fig or a raisin added will make it work more quickly.

Acid Yeast.—A medium sized potato, 1½ tablespoons sugar, ½ teaspoon citric or tartaric acid, 1 cup warm water, 2 teaspoons flour.

Method.—1. Boil and mash potato, add other ingredients and sufficient water to keep mixture at cupful.

2. Bottle and cork tightly.

3. Keep in a warm place 12 hours in an old yeast bottle and 24 hours (at least) in a new bottle.

White Bread.

Small quantity.—1½ lbs. flour, ¾ pint tepid water, 2 tablespoons home-made or 1 level tablespoon brewer's yeast, 2 teaspoons sugar, 1 teaspoon salt.

Method.—1. Sift and warm 1 lb. flour, make a well in the centre.

2. Beat yeast and sugar to a cream.

3. Pour yeast and tepid water into flour and stir to a moist dough. Beat well.

4. Cover and stand in a warm place till the dough doubles its size. (Brewer's yeast takes about 1 hour and home-made several hours).

5. Turn to a floured board and knead in the extra ½ lb. flour and salt until the dough is of even texture.

6. Shape into loaves, put into greased and floured tins.

7. Allow to rise in a warm place about half an hour.

8. Cook in a hot oven until the loaf is well risen and brown, then place in a cooler part until the bread is cooked through—30 to 40 minutes in all.

9. When cooked the bread should give a hollow sound when tapped on the bottom.

Wheaten Meal Bread.

1½ lbs. whole meal or half whole meal and half plain flour, 1 tablespoon yeast, 1 teaspoon salt, ¾ pint tepid water, 1 teaspoon sugar.

Method.—Proceed as for white bread, but more moisture, a hotter oven, and longer cooking is required.

The actual baking of bread is perhaps the most important part. With the utmost care in choosing flour, making yeast, and carrying out the correct procedure for mixing, if the oven is not at the right temperature the bread may be spoilt. The scentific baking of bread is to fix the air cells as quickly as possible by means of the hot oven. A novice would do well to test the oven thus:—Place a tablespoon of flour on a saucer for five minutes in the oven. If the oven is—

(a) Hot—the flour becomes dark brown.

(b) Moderate—the flour becomes a golden brown.

(c) Cool—the flour becomes pale brown.

The yeast will go on working or growing in the flour if the oven is too cool, still splitting up the starch and more alcohol is formed, which cannot escape. The bread has then a "beery" taste. If, on the other hand, the oven is too hot and the loaf begins to brown in less than 15 minutes, a crust is formed and the inside of the loaf remains damp and uncooked.

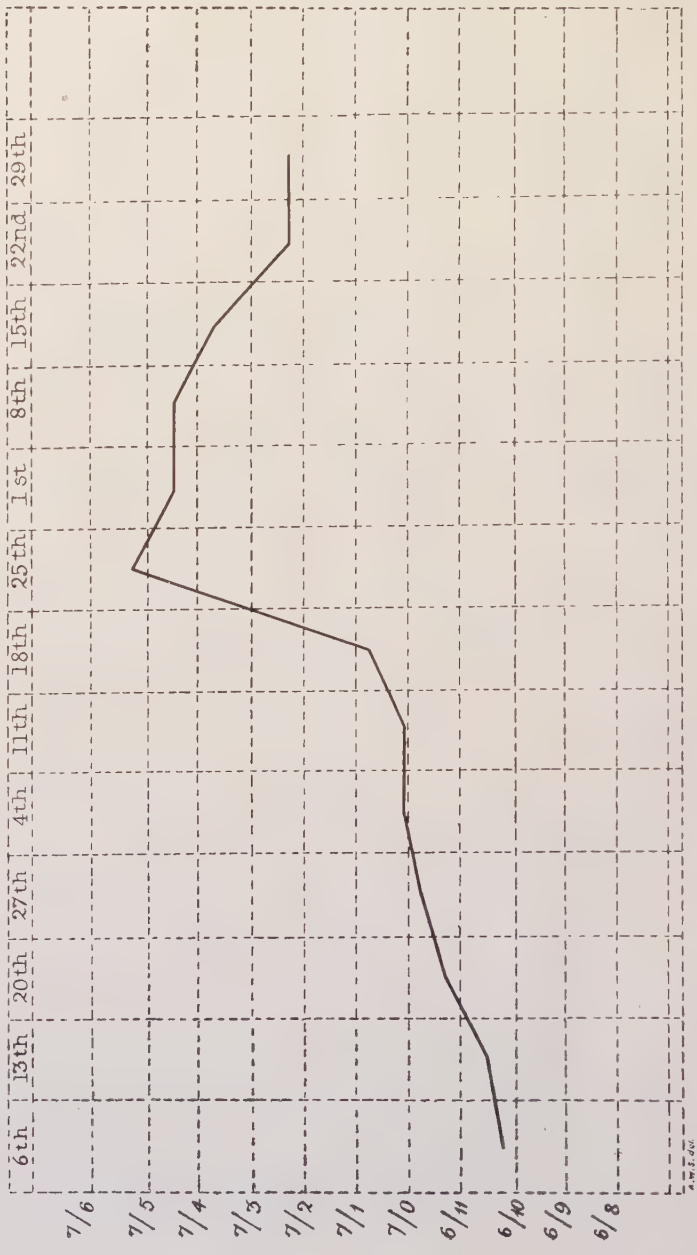
Abnormal Fermentations.—The normal fermentation in bread making is due to the energy of the yeast plant growing and multiplying in the dough, giving off CO_2 and producing changes which result in making bread palatable and digestible. Other fermentations, however, sometimes occur.

Sticky or sour bread is due to lactic acid bacteria. These are associated with low-grade flour. The germs of these bacteria often lie dormant until essentials, such as warmth and moisture, necessary to their growth, are provided, and they then develop. Injurious germs also appear with yeast. This is sometimes overcome by the use of hops, which assists true yeast to overpower poor yeast. Dirty utensils and troughs harbour injurious bacteria. All crevices and cracks are teeming with unseen life, which reproduce enormously when given favourable conditions.

Musty or mouldy bread is usually noticed only after bread has been cut. This is due to damp flour in which fungi or mould has developed. Bags, containers, etc., holding this flour should be thoroughly scalded and scoured before being used for a fresh supply.

The same procedure should be carried out if bread is what is termed "ropy," or when tiny red marks appear. These, too, are the effects of wild yeasts, which have found their way into the dough.

RETURN of WHEAT PRICES PER BUSHEL C.I.F & E. LONDON



Compiled from figures kindly supplied by the Co Operative Wheat Pool of Western Australia

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith, & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK AT METROPOLITAN FAT STOCK MARKETS, DURING MONTHS OF SEPTEMBER, OCTOBER, AND NOVEMBER, 1926.

	SEPTEMBER.					OCTOBER.				NOVEMBER.			
	1.	8.	15.	22.	29.	6.	13.	20.	27.	3.	10.	17.	24.
Sheep and Lambs	7,060	10,079	10,411	14,091	11,375	10,273	17,130	14,789	14,064	13,359	13,339	12,865	13,398
Cattle ...	511	1,085	614	605	615	416	650	549	582	569	699	1,202	869
Pigs ...	846	578	678	658	895	404	767	609	765	711	973	448	398

COMPARATIVE VALUES OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS, DURING MONTHS OF SEPTEMBER, OCTOBER, AND NOVEMBER, 1926.

	SEPTEMBER.					OCTOBER.				NOVEMBER.			
	2.	9.	16.	23.	30.	7.	14.	21.	28.	4.	11.	18.	25.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Mutton	8½	8	8½	8¼	8¾	8¾	W. 9 O.S. 5½	W. 9 O.S. 5½	5½	5¼	5¾	5¾	5¾
Beef ...	5	4½	5½	6	5½	5	6	6	6½	5½	6	5½	5½
Pork ...	11	11	10½	10	10	9½	10	10½	10¼	10	9¼	10	10
Bacon ...	8½	8½	8½	8½	8½	8½	8½	8¾	8½	8¼	8	8	8

MARKET REPORT.

The following particulars of the approximate quantity of chaff available for auction at the metropolitan chaff and grain sales, held in Perth during the months of September, October, and November, also the minimum and maximum prices ruling for f.a.q. to prime quality wheaten, have been supplied by Messrs. H. J. Wigmore & Co., Limited, of Wellington Street, Perth:

September—Quantity—1,600 tons.
Maximum price—£7 per ton.
Minimum price—£6 10s. per ton.

October—Quantity—1,300 tons.
Maximum price—£7 per ton.
Minimum price—£6 2s. 6d. per ton.

November—Quantity—2,200 tons.
Maximum price—£5 15s. per ton.
Minimum price—£5 per ton.

At the time of writing our last report for this Journal (in August last), the market stood at £6 2s. 6d. per ton, but in September an improvement took place in the market for best quality chaff, which was inclined to be rather scarce. New season's chaff from various outlying districts in the wheat belt began to arrive about the end of September, but the sample was rather poor and sappy, some of it being cut from self-sown crops. The first consignment of prime new season's from the hay districts arrived in Perth on the 12th October. This was from Messrs. W. Ripper & Sons, Woolundra. The sample was perfect, and the consignment met with spirited competition, being disposed of at £6 15s. per ton. After that date supplies of good new season's became available, but owing to the stormy weather conditions in October supplies arriving were rather erratic, and the market was subject to severe fluctuations. Consignments arriving in November were rather heavy and the market sagged to £5, but as soon as it became known that the quantity of hay cut in the hay districts was far below expectations, a decided strengthening took place, and the market on the 30th November stood at £5 10s. From reliable reports received from districts embracing Northam, Meckering, Kellerberrin, and Baandee, indications are that the quantity of hay cut in those districts is considerably less than last season, and we feel sure that in the near future much higher prices will rule for chaff of prime quality.

Oaten Chaff.—As usual, the market has fluctuated in sympathy with the price of wheaten, and, at the time of writing, prime green samples are worth £5 12s. 6d. to £5 15s. per ton; f.a.q., £5 7s. 6d. to £5 10s.; mediums, £5 to £5 2s. 6d.

Oats.—A steady demand for oats has been experienced during the past three months, good heavy feeds selling at from 2s. 8d. to 2s. 9d. per bushel. However, supplies of new season's are now becoming plentiful and the market has an easier tendency, and we should not be surprised to see values a little lower in the near future.

Wheat.—During the past month heavy supplies have been arriving on the Perth market, and f.a.q. has been selling at from 5s. 8d. to 6s. per bushel.

Barley.—A few consignments of new season's are arriving, the value of good, clean Cape being 3s. 8d. to 3s. 9d. per bushel; others, 3s. 4d. to 3s. 6d.

METEOROLOGICAL INFORMATION.

1926.

Stations.	Temperature.				Rainfall.		Temperature.				Rainfall.		Temperature.				Rainfall.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	SEPTEMBER, 1926.						OCTOBER, 1926.						NOVEMBER, 1926.					
					inches	inches					inches	inches					inches	inches
Chapman Farm ... State	72·8	85·7	46·9	39·0	1·92	1·65	77·1	97·5	51·5	43·7	1·62	0·97			not	received.		0·22
Geraldton	71·7	85·5	53·0	44·8	1·40	1·38	73·7	94·0	57·6	46·4	0·87	0·72	79·2	103·8	61·7	51·2	0·73	0·25
Walebing	68·6	84·5	43·3	35·0	1·97	2·22	72·3	94·6	47·2	38·0	2·47	1·33	81·4	99·0	55·5	45·0	1·86	0·52
Perth	68·0	84·8	49·9	43·0	3·91	3·40	69·1	87·2	54·2	47·7	3·67	2·18	76·7	95·8	58·0	47·9	1·59	0·79
Kalamunda	69·2	84·2	48·8	40·3	5·72	4·64	69·2	87·2	51·7	41·0	4·65	3·29	76·9	93·9	54·5	47·5	1·97	1·09
Bunbury	66·0	74·8	49·5	39·2	3·64	3·72	67·1	76·8	54·3	45·0	4·01	2·46	75·0	92·2	55·2	40·4	0·97	1·04
Bridgetown	65·5	81·0	42·7	33·5	5·73	3·86	67·1	85·0	47·6	37·5	6·05	3·01	76·0	95·0	50·0	37·0	1·79	1·15
Albany	63·4	75·4	47·7	40·4	5·30	4·02	65·8	78·0	50·7	44·0	3·31	3·27	68·3	89·6	54·5	43·4	1·89	1·34
Merredin Farm State	70·4	86·8	43·0	31·1	1·00	0·96	76·1	99·8	47·9	39·2	0·71	0·86	81·3	101·2	56·8	42·8	0·35	0·40
Northam	69·5	85·8	45·0	38·5	1·18	1·67	71·2	93·2	50·6	41·8	1·58	0·99	79·2	97·7	56·6	43·1	1·62	0·38
York	69·9	86·2	43·1	35·0	2·04	1·63	72·8	94·0	48·7	42·0	1·88	1·04	81·5	99·0	55·7	47·0	0·98	0·43
Narrogin Farm State	66·0	80·3	42·6	33·1	2·57	2·32	69·2	91·3	46·8	39·6	2·68	1·45	78·7	94·0	51·5	35·0	0·69	0·58
Katanning	65·1	81·0	44·5	36·3	1·89	1·95	67·8	86·7	47·1	38·7	2·75	1·57	77·4	95·3	51·7	39·0	0·69	0·64
Cape Leeuwin ...	62·4	67·0	53·2	45·2	4·65	3·18	63·3	67·2	54·5	47·8	6·55	2·84	68·1	79·0	57·5	46·5	1·63	1·26

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The following publication may be obtained from the Department of Agriculture, Perth, on application, or will be sent post free to any address in this State on receipt of a remittance for the amount stated :—

The Handbook of Horticulture and Viticulture of Western Australia, by A. Despessis, M.R.A.C.:

This publication contains valuable information dealing with all commercial fruits grown in Western Australia, including advice on planting, pruning, packing, manuring, fruit-drying, wine-making, insect and fungoid pests and their treatment, etc., and the whole forms a text book which every fruitgrower, whether large or small, should have in his possession. The price originally was 8s. 6d., but to allow of distribution being as wide as possible it has been reduced to 2s.

Agricultural Bank.

ADVANCES TO FARMERS:

The Agricultural Bank, which is a State institution and is worked under a Special Act, was founded with the object of making advances to settlers for the purpose of assisting and encouraging them during the early years of the development of their farm.

The Agricultural Bank makes advances on approved securities to approved persons engaged in the business of farming or grazing, or in horticultural pursuits, to an amount not exceeding £2,000.

Every application must be made on the prescribed form, and must contain full particulars of the purposes for which the advance is required.

Where an advance is approved for effecting improvements on the borrower's land, such advance is made by progress payments as the work progresses.

Developmental advances are usually made for clearing, fencing, ringbarking, and water supply, and are made to the full value of the work done after it has been inspected and certified to by a responsible officer. After a reasonable stage of development has been reached, and providing the general progress of the settler is considered satisfactory, limited assistance is granted towards building (maximum £250), and money is provided to assist in the purchase of stock and machinery, the maximum amount for this purpose, except in special cases, being £150.

Interest is charged at the rate of seven per cent. per annum, and repayment of principal extends over a period of 30 years, except in the case of stock or machinery advances which have a currency of eight years only.

The security required by the Bank is a first mortgage over the lands on which the advance is to be expended, and such lands may consist of:—

(a) Holdings in fee simple; or
(b) Holdings under Special Occupation Lease or Conditional Purchase from the Crown; or
(c) Homestead Farms; or
(d) Such other real or leasehold property as the Trustees may think fit.

Mortgages are prepared free of charge; but borrowers are required to pay the statutory costs of registration.

Interest only on the advances made is charged during the first 10 years, and repayment of the capital does not commence until the eleventh year.

Application may be for sums of £25, or any multiple thereof, not exceeding £2,000. Each application must be accompanied by a valuation fee of one per cent. of the amount applied for. No refund of fee is allowed after an inspection of the security has been made.

The leases, or Occupation Certificate, as the case may be, together with the fees, must be in the possession of the Bank before a mortgage can be prepared.

REGISTRATION FEES.

	s.	d.
For each Conditional Purchase, Homestead Farm, or Grazing Lease under the Land Act	5	0
For each Freehold Lot or Crown Lease	10	0
For every additional Freehold Lot or Crown Lease	2	0

STAMP DUTY

	s.	d.		s.	d.
Up to £50	1	3	From £301 to £400	10	0
From £51 to £100	2	6	„ £400 „ £500	12	6
„ £101 „ £150	3	9	Stock Bill of Sale, up to £50	5	0
„ £151 „ £200	5	0	„ „ over £50	10	0
„ £201 „ £250	6	3	Machinery Bill of Sale, up to £50	5	0
„ £251 „ £300	7	6	„ „ „ over £50	10	0

Intending borrowers are requested to note that no advances are made against improvements effected prior to date of application. Applications should, in every instance, be lodged prior to commencement of work, and moneys are then paid over in progress payments as the work proceeds.

IMPROVED FARMS.

The Trustees of the Agricultural Bank have, from time to time, improved farms on their hands which have been abandoned for various causes, or have been taken over as security for loans. These farms are available for purchase, and extended terms are given for payment of the amount. They often offer to intending settlers an opportunity of obtaining an improved holding, ready for occupation, at a cheap rate, without having to undertake the preliminary work of clearing and fencing. The properties, when obtainable, are advertised in the "Government Gazette"; but anyone wishing for particulars of such farms as may be available should make application to the Managing Trustee of the Agricultural Bank. Particulars will then be sent, and an inspection can be made by the intending settler to ascertain whether the same is suitable for his requirements.

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3—4

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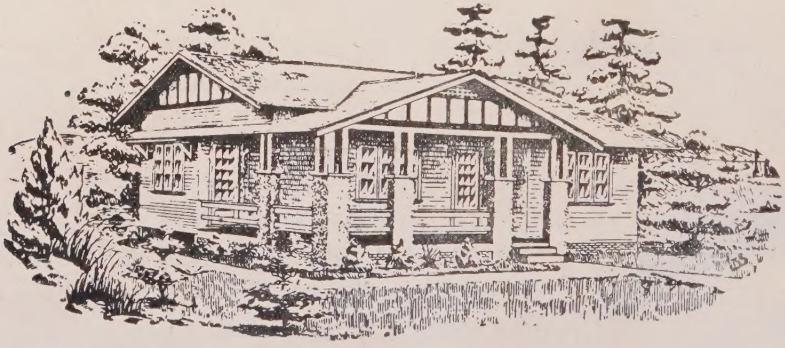

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4—4